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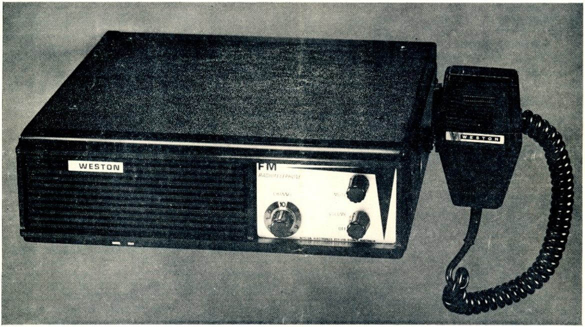

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COVER STORY

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QSP

EASTER 1972

Easter means different things to different people. To most it is a break from work—holidays; for some it is a time of deep religious significance; and to children, it is the time for chocolate eggs and the Easter Bunny. But to a group of fifteen to twenty Amateurs it is a time for work. Admittedly, for most of them a type of work different from that of their normal daily toil. Nonetheless, it was still work and this dedicated band of people met together in a motel at Parkville, Melbourne, over the Easter week-end of March/April, 1972. The occasion was the thirty-sixth Federal Convention of the Wireless Institute of Australia. Councillors from all the Divisions of the Institute were in attendance as well as members of the Federal Executive, whilst s.w.l. members of the Victorian Division assisted with recording equipment.

As at previous Federal Conventions, many valuable discussions took place, but this year there were some differences. This Convention was the first held within the framework of the Federal Company formed earlier this year and consequently Councillors were able to vote without their decision being subject to later Divisional ratification.

For much of the Convention two prominent members of the N.Z.A.R.T. sat in and on a number of occasions were able to assist the Council in its deliberations. In particular, the editor of "Break-In," Mr. Don Mackay, ZL-3RW, and the editor of our own "Amateur Radio" were able to discuss much of mutual interest and it is anticipated that close ties will be maintained with our sister society.

Mr. Gareth Bradshaw, ZL3VP, a Councillor of the N.Z.A.R.T., described the contributions the N.Z.A.R.T. members make to the public in New Zealand through their A.R.E.C. organisation—"Amateur Radio Emergency Corps" and these gave much food for thought to W.I.A. Federal Councillors.

Thirty-three items were on the agenda and those plus the various reports and statutory requirements of an annual general meeting meant that nearly thirty hours were spent by the Council around the conference table. Agenda items ranged over a number of subjects including a review of the licensing structure in Australia, new v.h.f. awards, W.I.A. Project Australis and future planning of v.h.f./u.h.f. bands.

The question of the licence structure was considered at length and the W.I.A. has adopted the policy of a four "grade" structure. The Executive will now present the case for this to the P.M.G. Department, but it is stressed that a result cannot be expected within the next two or three months. Brief details are as follows:

Grade A—formerly A.O.C.P. with all qualifications and privileges as at present.

Grade B—a new licence involving regulation and theory examinations as for Grade A plus a 5 w.p.m. c.w. test. Privileges to be operation on the 21 MHz. band and above on all modes. A holder may convert to Grade A at any time by passing the appropriate c.w. exam.

Grade C—formerly A.O.L.C.P. but with the restriction that all new licensees would be permitted operation on 144 MHz. and above only. Present A.O.L.C.P. holders, however, would retain all their privileges. A holder may convert at any time to Grade A or B by passing the appropriate c.w. exam.

Grade D—a new licence involving a regulation exam. as for Grades A, B and C plus a lower level theory exam. and a 5 w.p.m. c.w. test. Privileges to be 10 watts d.c. input c.w. only, crystal controlled transmitters; frequency sub-bands permitted—21.075 to 21.150 MHz. and 28.100 to 28.200 MHz.; two years tenure in which time a holder must convert to either Grades A or B or else the licence will lapse.

(Continued on Page 20)

VHF TRANSEQUATORIAL PROPAGATION

PART ONE

*ROGER LENNED HARRISON,**
VK2ZTB, ex-VK3ZRY

• Reception of VHF signals over very long paths that cross more-or-less transversely to the equatorial zone have been reported on many occasions in the last 25 years. The frequencies involved are generally far in excess of the predicted MUF and signal strengths sometimes approach free-space values. Path lengths reported are usually greater than 5,000 km. with a few up to 18,000 km. These signals are generally regarded as having arrived by "anomalous" transequatorial propagation.

Throughout the remainder of this article the author uses the letters TEP to denote this form of propagation, dropping the word "anomalous" since it turns out that it is not so anomalous as was first thought.

A SHORT HISTORY

The first instances of intercontinental VHF contacts were reported in "QST" by Ed Tilton in "The World Above 50 Mc", May and October 1947.[1,2]

The discovery of TEP by Radio Amateurs did not receive a great deal of attention in the scientific world until the late 1950's and the IGY in 1957/58.

Contacts between Australia and Hawaii, Mexico and Argentina, and the U.S.A. and Peru were fairly common during the years 1947 to 1951. There was then a sharp decline during the sunspot minimum, but new reports began to appear again in 1955. The number of reports reached a maximum during 1957 to 1960 and again during 1968 to 1971. Some contacts were reported over extremely long paths, e.g. South Africa to England (1,300 km.), Buenos Aires to Western U.S.A. (9,860 km.), Argentina to Hawaii (12,150 km.), Argentina to Japan (18,760 km.), and Australia to Mexico (10,500 km.).

The first scientific paper to appear on the phenomena of TEP was by Ed Tilton, published in the Proceedings of the Second Meeting of the Mixed Commission on the Ionosphere in Brussels 1951.[3]

The contacts were rather surprising since the frequencies used exceeded the conventional MUFs for the circuits involved and path lengths were far in excess of that possible for a single hop mode via the ionosphere.

From the late 1950's ionospheric scientists took quite a deal of interest in this form of propagation and early efforts aimed at explaining the phenomenon attempted to correlate these unusual contacts with magnetic/ionospheric storms.[3,4] However, only a few could be correlated with these storms and most contacts could not be explained in this fashion.

Observations made between 1950 and 1966 by a number of people of the characteristics and propagation modes of TEP,[5-11] along with research into the equatorial ionosphere,[11] brought to light a lot of very interesting information about TEP. In addition to collecting Amateur observations, a number of experiments were set up involving HF and VHF scatter soundings, oblique incidence stepped frequency ionosondes, CW beacon observations, observations of TV and FM stations in Korea, Japan and Russia, and topside ionospheric sounding by satellites. These efforts led to a better understanding of the structure of the equatorial ionosphere and to suggestions regarding the various modes that support TEP.[12]

However, all is not yet explained, and research is currently being carried out in Australia by the Department of Supply, the Ionospheric Prediction Service Division and the Physics Department of the James Cook University at Townsville. Of particular interest to the author is the night-time mode about which more will be said later.

The current research programme being carried out in the low latitude section of the IPSD includes the reception of beacon transmissions, examining the signal characteristics and correlating this information with other geophysical phenomena.

GENERAL CHARACTERISTICS OF VHF TEP SIGNALS

There appears to be two distinct types of TEP, distinguished by the times of peak occurrence, fading characteristics, path lengths, and the principal mode of propagation.

One mode, designated **Class I.**, exhibits the following characteristics:—

(a) A peak occurrence around mid-to-late afternoon (1200 to 1900 local mean time, measured at the point where the path crosses the magnetic equator).

(b) Normally strong, steady signals with a low fading rate and, more specifically, a small Doppler spread (around ±2 to 4 Hz.).[12]

(c) Path lengths of 6,000 km. to 9,000 km. and sometimes longer.

The proposed propagation mode for Class I. TEP is generally termed the "super-mode" or ²F mode. As can be seen from Fig. 1, the ray, transmitted from A, "skips" from the crest in the equatorial ionosphere at X, across to the crest at Y and is refracted down to earth at B. These "crests" are a feature of the equatorial ionosphere about which more later.

The other mode, designated **Class II.**, shows the following characteristics:—

(a) A peak occurrence around 2000 hours to 2300 hours local mean time.

(b) High signal strengths but with deep, rapid fading (typical rates are 5 Hz. to 15 Hz.) accompanied by a Doppler spread much greater than for Class I. Generally the Doppler spread is in the order of ±20 to 40 Hz. (i.e. ten times that for Class I.).[12]

(c) Path lengths are usually shorter than for Class I., being around 3,000 km. to 6,000 km. Sometimes they are longer.

The propagation mode or mechanism for this class of TEP is not yet fully understood, but it is believed that irregularities (dense "clouds" of electrons having a certain specific shape) in the equatorial ionosphere, which are aligned with the earth's magnetic field, are responsible for "ducting" or efficiently "scattering" the signal such that the path geometry looks like that in Fig. 1 (from C to D).[12]

Additionally, Class II. will support much longer frequencies than Class I. and signals have been observed up to 102 MHz. This does not imply that 102 MHz. is the maximum frequency that Class II. TEP will support. It is just that **nobody has reported an authentic case any higher in frequency.**

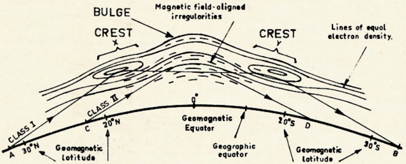


Fig. 1.—The propagation modes of Class I. and Class II. TEP.

* Ionospheric Prediction Service Division of the Bureau of Meteorology, 162-166 Goulburn Street, Darlinghurst, N.S.W.

Who will be the first to make Australia-Japan on 144 MHz. via TEP? No upper limit has yet been proposed for Class II. TEP.

Class I. TEP is sometimes called "afternoon-type TEP" and Class II. is sometimes called "evening-type TEP" for obvious reasons.

Before discussing TEP in further detail, we should look at the equatorial ionosphere.

THE EQUATORIAL ANOMALY

The equatorial ionosphere does not have an even distribution of electron density. As can be seen from Fig. 1, the F-region iso-electronic contour lines (lines of equal electron density) show a depletion of electrons, together with a rise of the F-region height, above the magnetic equator. Roughly sym-

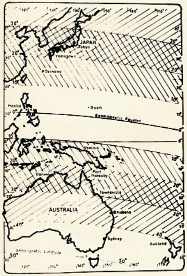


Fig. 2.—Australasian sector of the world showing terminal zones for Class I. TEP (20 deg. to 40 deg. geomagnetic latitude) and Class II. TEP (10 deg. to 30 deg. geomagnetic latitude).

metric, north and south of the geomagnetic equator, are two "crests" that represent an increased electron density in the F-region. These crests are located between 10° and 20° (geomagnetic latitude) north and south of the geomagnetic equator.[13] The location of these regions can be obtained from Figs. 2, 3 and 4 which are maps of the various continental zones with the geomagnetic latitude lines superimposed.

This region of the ionosphere (within aproximately ±20° geomagnetic latitude) is generally referred to as the equatorial anomaly region despite the fact that it is a regular feature of the equatorial ionosphere.

If the electron density within the crests increases sufficiently it will be possible for a signal, incident upon one crest at a very small angle, to be refracted across the geomagnetic and geographic equators to the opposite crest and thence to earth as illustrated in Fig. 1.

VIRTUAL HEIGHT OF THE EQUATORIAL ANOMALY

The virtual reflection heights of signals in the anomaly zone varies between about 350 km. and 550 km.,[12, 13] giving path lengths in the order of 3,000 km. to 9,000 km.[12] for signals propagated by the modes shown in Fig. 1.

DIURNAL VARIATION OF THE EQUATORIAL ANOMALY

In the Australasian sector of the world, the equatorial anomaly starts to develop between 0800 LMT and 1000 LMT, the crests moving away from the magnetic equator between 0700 LMT and 1500 LMT.[13]

In the American sector, the development time of the equatorial anomaly is much more variable, but it is generally present after 1800 LMT. The build-up of the anomaly appears to occur between 1100 LMT and 1800 LMT. However, these statements must be tested further since they are based on very little data.

Comparisons between the positions of the crests over the Australasian sector and the American sector at the same LMT show that they are further from the equator in the Australasian sector than they are in the American sector.[13]

The behaviour of the anomaly in the African sector is similar to that in the Australasian sector.

When the sun sets on the base of the equatorial ionosphere (about 1½ hours later than ground sunset, i.e. 1930 hours LMT), the base of the layer generally rises and the equatorial anomaly begins to break up into large "blobs". This is not always so, the base of the layer may not necessarily rise and, on occasion, is found to fall or remain at the pre-sunset height. Sometimes the anomaly does not break up into distinct blobs and the electrons appear to diffuse

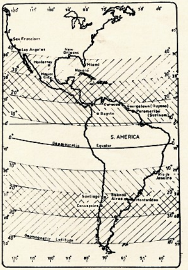


Fig. 3.—The American sector of the world showing terminal zones for Class I. TEP (20 deg. to 40 deg. geomagnetic latitude) and Class II. TEP (10 deg. to 30 deg. geomagnetic latitude).

over the magnetic equator. The ionosphere is generally like this during early morning and late evening.[13] The detailed behaviour of the decay phase of the equatorial anomaly has not yet been fully established.

THE EQUATORIAL ANOMALY AND MAGNETIC ACTIVITY

On magnetically disturbed days the equatorial anomaly is not as well developed as it is on magnetically quiet days and it is known that, in the Australasian sector, the bulges are closer to the magnetic equator on disturbed days than on quiet days.[13]

Recent research also indicates that, in the American sector, the anomaly develops earlier on very quiet days and in the late afternoon on disturbed days.

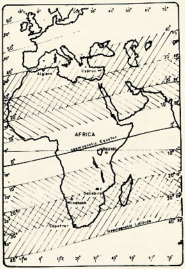


Fig. 4.—The African-Mediterranean sector of the world showing terminal zones for Class I. TEP (20 deg. to 40 deg. geomagnetic latitude) and Class II. TEP (10 deg. to 30 deg. geomagnetic latitude).

Insufficient work has been done in the Australasian sector to give a complete picture (which promises to be quite complex) of the influence of the level of magnetic activity on the equatorial anomaly.

SEASONAL VARIATIONS OF THE EQUATORIAL ANOMALY

The crests lie very nearly symmetrically either side of the magnetic equator at equinox and asymmetrically at solstice. The electron densities of the bulges are greater at equinox than at solstice and this, combined with the anomaly symmetry at equinox, favours Class I. TEP at the equinoxes. The separation and overall width of the crests varies seasonally also, being greatest at equinox.

"Tilts" in the base of the F-layer are known to be associated with the crests and are most pronounced between 1200 and 2000 LMT and at equinox.[11] These tilts, which are departures of the iso-electron density contours from concentricity with the earth, enhance the tangency of a radio wave with the

layer, consequently increasing the MUF for suitable circuits and improving the chances of propagation via a super-mode (Fig. 1).

SUNSPOT CYCLE VARIATIONS OF THE EQUATORIAL ANOMALY

At sunspot maximum the break up of the crests is generally later than at sunspot minimum.[11] This appears to be the major effect of the sunspot cycle on the equatorial anomaly.

The relative depletion of electrons over the geomagnetic equator is greater at sunspot maximum than at minimum. There is a consequent increase in the number of electrons in the crests at maximum and an increase in the presence of tilts, increasing the MUF.

The crests of the equatorial anomaly are present for fewer hours during sunspot minimum and their height, size, associated tilts and ionisation density decrease with decrease in sunspot number.[11]

All these factors contribute to the observed dependence of Class I. TEP on the sunspot number.

"SPREAD-F" OR "RANGE-SPREADING"

On some days irregularities start to appear in the base of the F-layer by 2000 hours LMT and cause what is termed "range-spreading" or "spread-F" on vertical incidence ionograms. An illustration is given in Fig. 5, comparing an "unspread" ionogram to one showing spread-F for different times on the same day at Cocos Island. The cause of these irregularities is not yet known. They are not necessarily associated with the decay phase of the equatorial anomaly. There appears to be a connection between spread-F and evening-type TEP.[14]

The duration of spread-F is quite variable, sometimes lasting for less than hour and at other times lasting until 0600 hours the next morning.

The occurrence of spread-F is more common on magnetically quiet days, in periods of sunspot maximum, and is more common in areas where the geomagnetic and geographic equators are widely separated.[11] There appears to be no correlation between magnetic activity and spread-F at sunspot maximum.

The occurrence of spread-F favours the equinoxes, particularly in the Australasian sector,[11] except at sunspot minimum where it favours the summer solstice. This effect is not so pronounced in the American sector.

Spread-F appears to be dependent on the post-sunset rise of the F-layer base which is most pronounced at sunspot maximum.[11]

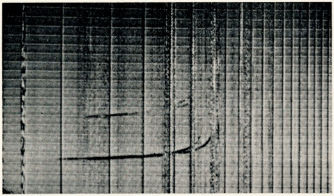


Fig. 5 (a)—Vertical incidence ionogram from Cocos Island, 1900 hours LMT, 5th August, 1970, showing typical F-layer trace without range-spreading.

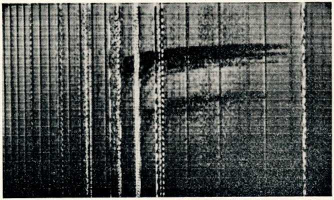


Fig. 5 (b)—Vertical incidenle ionogram from Cocos Island, 2200 hours LMT, 5th August, 1970, showing typical equatorial spread—F or range spreading. Range spreading is caused by oblique incidence reflections from irregularities in the base of the F-layer.

CLASS I. TEP—CAUSES AND CHARACTERISTICS

It is now well established that Class I. TEP depends on the equatorial anomaly. All the observed variations and characteristics of the equatorial anomaly influence Class I. TEP in a predictable manner. However, what is the cause behind the cause? or, what causes these two crests that are a feature of the equatorial inosphere?

The Fountain Effect

During the day, electrons from the base of the F-layer move upwards, in the region of the magnetic dip equator (where the magnetic field lines are horizontal), under the combined influence of the earth's magnetic field and the electric field that exists between the E-layer and the F-layer. These electrons then diffuse along the magnetic field lines and accumulate at two places, either side of the magnetic equator, forming the crests of the equatorial anomaly.[15] The effect is illustrated in Fig. 6.

This explanation is, of necessity, simple and perhaps not entirely accurate, but should serve for the purpose of this article. For those who wish to know more, read reference 15.

The effect of the equatorial anomaly on foF2 (critical frequency of the ordinary ray at vertical incidence for the F2 layer) for the area either side of the geomagnetic equator is given in the inset of Fig. 7. As can be seen, foF2 reaches a peak where the crests are located and a trough over the magnetic equator. This partly accounts for the high MUFs observed when supermode propagation is used.

DETAILED CHARACTERISTICS

The characteristics of Class I. TEP will now be discussed in detail with reference to its dependence on the equatorial anomaly. The reader can refer back to particular paragraphs in the discussion of the equatorial anomaly if necessary to elucidate the dependence of various characteristics on the associated characteristics of the equatorial anomaly.

Occurrence Times

There is a peak occurrence of Class I. TEP between 1200 and 1900 LMT for all sectors. Individual circuits will have slightly different peak occurrence times somewhere within these limits. The peak occurrence times coincide with the stable phase of the equatorial anomaly which is generally well developed after 1100 LMT and begins to decay around 1900 LMT. Occasionally it remains stable after this time, particularly at equinox at sunspot maximum[11] and observations bear this out, signals remaining stable for several

hours after 1900 LMT before experiencing the flutter fading of Class II. TEP.[12]

Paths that are normal (or nearly so) to the geomagnetic equator and symmetrically located either side are favoured, experiencing earlier start times, longer durations and a greater number of occurrences—especially at sunspot minimum.

Australia and Asia-Japan are ideally situated in this regard as are Central/South Africa and North Africa/Mediterranean. The Americas are not so well off except for circuits involving Venezuela, Guyana, Surinam, etc., and Chile/Argentina. See the maps in Figs. 2, 3 and 4.

TEP can occur at any time of the night or day, but it is most infrequent between 0400 and 0800 LMT[11] for either Class I. or Class II. TEP.

Occurrence times are generally dependent on:—

(a) Suitable path geometry, including tilts which allow supermode propagation.
(b) Build up of sufficient ionisation density in the crests of the equatorial anomaly such that foF2 of each crest is sufficiently high to increase the MUF above that normally expected.
(c) Sunspot number (b) is obviously dependent on sunspot number, but this is not the only factor involved. This dependence is not as great as one would imagine and is much less than for Class II.
(d) Season.

Path Characteristics

As Class I. TEP is propagated via a supermode (Fig. 1) the path geometry can be determined for the maximum and minimum range possible for the observed parameters of the bulges of the equatorial anomaly. The parameters affecting the path geometry are the height and location of the virtual reflection points, foF2 for these points and incidence angles to those points. Knowing these, it becomes possible to predict the maximum and minimum ranges. These work out to be between 5,000 and 9,000 km.[12] This was calculated assuming that the path and equatorial anomaly were symmetrical about the geomagnetic equator.

Oblique paths and asymmetrical paths will encounter different conditions about which more will be said later.

The best paths are those which are located symmetrically about and normal (or nearly so) to the geomagnetic equator and the terminals of which lie in areas between 20° and 40° geomagnetic latitude north and south of the geomagnetic equator. These areas are marked in Figs. 2, 3 and 4 (cross hatched to the right). These paths tend to experience Class I. TEP more often than oblique or asymmetrical paths.

Very long paths (greater than 10,000 km.) are always oblique and some other form of propagation appears necessary to assist the signal in being favourably incident on the bulges of the equatorial anomaly. Sporadic E (Es) is the most likely cause but this has yet to be confirmed. An observation by Roger Hord, VK2ZRH (private communication) appears to support this. On 8th November, 1970, he reported hearing WB6KAP on 50 MHz. from 1310 to 1435 EAST. At the same time he reported sporadic E signals from New Zealand. Now WB6KAP is located in California some 12,000 km. from Sydney. For this signal to have been refracted across the equator via a supermode, it must have struck the southern crest of the equatorial anomaly somewhere above Western Samoa which is some 4,500 km. from Sydney. A ray, leaving the earth tangentially would strike the F-layer some 2,000 km. away at the most. Thus some other form of propagation was necessary for the signal to reach Sydney. It works out that it is possible for sporadic E, located over the Tasman Sea east of Australia, to refract the signal sufficiently for it to arrive at the equatorial anomaly over Western Samoa.

Southern California is located sufficiently close to the geomagnetic equator for a ray to strike the equatorial anomaly at a favourable angle.

A ^{3}F mode has been suggested,[11] but as yet is unconfirmed. Its likelihood is rare.

of foF2 with geomagnetic latitude assumed for the particular circuit. The printout is reproduced here with the kind permission of Mr. B. C. Gibson-Wilde, of the James Cook University of North Queensland.

Ray focussing is a very important characteristic of Class I. TEP as it provides the strong signals and "area selectivity" (signals being heard in one narrowly defined area and not in others) that is often noticed as being associated with afternoon type TEP[10] (also reported by D. Tanner, VK8AU, private communication).

Many observers have noted that, from their location, TEP signals are observed first from the most eastern area and thence move west—following the sun. For example, Amateurs in the Eastern States of Australia first hear Amateurs in the eastern regions of Japan. The eastern stations gradually disappear and are followed by stations in central Japan, then western Japan, then Korea. Japanese Amateurs first hear stations in the eastern States (Qld., N.S.W., Vic.) and then stations in central regions of Australia (N.T., S.A.) followed by stations in Western Australia.

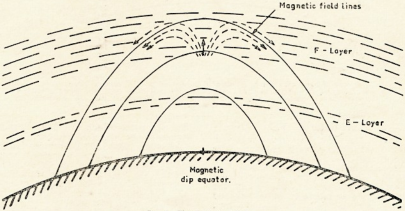


Fig. 6.—The Fountain Effect.

TEP over paths which are fairly oblique to the geomagnetic equator (65° or less) tend to be reasonably long (greater than 8,000 km.), rare, short lived and tend to occur mainly some weeks after the equinoxes. Many of them are asymmetrically situated with regard to the geomagnetic equator, but this bias is probably due to observer station distribution. Very long range TEP is generally observed one to two years after a sunspot maximum and rarely, if ever, during the sunspot minimum.

Ray Tracing

If a series of rays from a transmitter in one hemisphere is traced, using computer simulation through a model of the equatorial ionosphere, it is found that much of the low angle radiation travels via the supermode of propagation and experiences a large degree of focussing at the receiver.

In Fig. 7, a computer printout is shown illustrating this ray-focussing effect. The inset shows the variation

Referring back to the diurnal variations in the equatorial anomaly, you will notice that the build-up of ionisation in the crests is time dependent and hence the critical frequency is time dependent. Thus the region of maximum ionisation will follow the sun and will have a westward motion. Consequently contacts between Australia and Japan would be expected to commence first in the east and move westward.

Seasonal Characteristics

There is a maximum number of occurrences around the equinoxes for all sectors of the world. This is due to the more favourable conditions that exist in the equatorial anomaly at the equinoxes. Reference to the seasonal variations in the equatorial anomaly will show that the important parameters satisfy the best conditions for Class I. TEP at the equinoxes. The attitude of the earth with respect to the sun and the ecliptic plane is obviously the major controlling factor on the

symmetry of the equatorial anomaly at equinox.

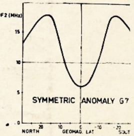
There is always a greater number of occurrences of Class I. TEP near the sunspot maximum than during the minimum. It is well known that sunspot number affects the MUF of the F-layer and foF2 for the crests of the equatorial anomaly follow a similar pattern.

However, the greatest number of occurrences of Class I. TEP lags behind the sunspot maximum by one to two years. The reason for this is, as yet, unknown.[11]

Contacts can be had almost daily around the equinoxes with Class I. TEP as was evidenced by the openings reported in "Amateur Radio"[16] and "QST" during 1970 and 1971 as well as earlier in "QST."[1,2] Similar results are recorded by oblique ionosondes operating on transequatorial circuits between Okinawa and St. Kilda (S.A.) and Okinawa and Townsville (Qld.).

that Class I. TEP affects the HF region as well as the lower VHF region. Contacts on the HF bands via Class I. TEP have been reported,[12] but are not often recognised by Amateurs.

The MUF for oblique paths is generally lower, owing to unfavourable "look" angles on the equatorial anomaly, and consequently the MUF for these paths exceeds 50 MHz. less often



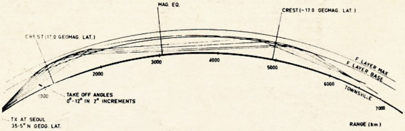


Fig. 7.—A copy of a ray tracing printout showing the focussing effect obtained when transmissions are propagated via the supermode. The inset shows the theoretical symmetric anomaly assumed in the ray-tracing programme that produced the printout. (Reproduced with the permission of B. C. Gibson-Wilde.)

Signal Characteristics

Apart from the frequencies involved, the most extraordinary characteristics of Class I. TEP signals are their strength and steadiness (absence of fade). Signal strength can sometimes approach free space values[12] and the fading rate is normally quite low and not very deep.[1–3, 7, 10–12] This is explained by the fact that rays strike the tilts associated with the crests of the equatorial anomaly very near to tangency and are efficiently refracted; this, combined with ray focussing, and the same absorption for a one-hop path, leads to very little signal loss.[7, 8, 10, 11]

Many Amateurs report good results running only medium to low power (under 20 watts) and small antennas[16] (also in private communications).

The low fading rate is also associated with a low Doppler shift—generally around ±2 to 4 Hz.[12] If a power spectral density graph (signal power level versus Doppler shift) is examined for Class I. TEP signals, it is observed that most of the Doppler shift is less than ±2 Hz. with another, smaller, peak at ±4 Hz.[12]

The peak MUF for Class I. TEP appears to be around 60 MHz.[12] which places the 6 metre Amateur band in a very fortunate position.

The frequencies involved in Class I. TEP will always be above the predicted MUF, for the path involved, by a considerable factor. So you can see than for paths which are more nearly normal to the magnetic equator.[7, 11, 12]

Although Class I. TEP provides fairly stable signals, wideband systems will suffer distortion due to multipath effects (see Fig. 7). Voice transmissions will not appreciably suffer, especially FM, but television picture signals will be of very poor quality.[12]

It must be understood that Class I. TEP is not a "normal" F2 mode of propagation as many VHF Amateurs seem to think, but it is certainly not "anomalous" within the definition of the word. The MUF of the F-layer for ¹F or ²F modes in general rarely exceeds 50 MHz. so that Class I. TEP cannot be classed as "normal" F2 skip on these grounds alone. Secondly, Class I. TEP travels via a two-hop ionospheric mode **without intermediate ground reflection**. This supermode or ²F-mode is sometimes referred to as "chordal-hop" propagation.

(to be continued)

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WILDCAT DX AWARD

The Eastern Zone of the Victorian Division of the W.I.A. has made available to v.h.f. operators the Wildcat DX Award certificate.

V.h.f. operators who establish contact with five stations normally resident in the Zone (who may be portable within the Zone) on all authorised frequencies 50 MHz. and above, excluding net and repeater frequencies, where the distance between the stations is 50 miles or in excess, can qualify by sending:—

1. Proof of log—for the v.h.f. award contacts on or after 1st Nov., 1971;
2. Three 7c stamps.

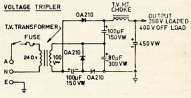
Send to Award Manager, VK3DY, Maffra.

A Voltage Tripler Power Supply Using TV Components

RODNEY CHAMPNESS, VK3UG*

The power supply transformers out of old television sets have been the basis for a great number of Amateurs' high voltage power supplies. The sources of supply of the t.v. type of transformer using a valve rectifier are not as common as a couple of years ago. The newer sets are using smaller transformers of the voltage doubler type. These, unfortunately, do not lend themselves to the much used technique of bridge rectification.

In the normal voltage-doubler mode the voltage obtained is in the vicinity of 250 volts. This, however, is not really suitable even for lower powered Amateur transmitting equipment. A voltage between 350 and 400 of high tension was required for a project so experiments were carried out with a voltage tripler. Good voltage regulation was not expected, but it was possible to obtain an output of 360 volts with a load of 120 mA., and an off-load voltage of about 400 volts. This regulation compared favourably with power supplies of the normal full-wave variety.



The voltage tripler circuit used is quite standard, but by re-arrangement of the circuit all standard t.v. electrolytics could be used with the exception of the last filter. In fact in the particular supply made up, only old t.v. components were used. The 80 μF. capacitor and the 450v.w. capacitor were chassis-mount can-type electrolytics. The two 100 μF.capacitors are the only two which are insulated from chassis, these types are usually insulated inside a plastic sheath anyway. The diodes are any 400 p.i.v. diodes.

This supply has proved to be a very economical way of getting about 350 to 400 volts using only scrap t.v.'s for parts. The sensible upper current level would be possibly about 160 to 180 mA.

[NOTE.—The working voltage of the final filter condenser would be the main thing to watch for. Owing to the choke, almost any value of C would give sufficient filtering. On the primary side of the transformer it would be preferable to have both input legs switched with a double-pole switch. If the unit is plugged into any g.p.o., it would be uncertain as to which leg was the active one.—VK3GK.]

* 24 O'Dowds Road, Warragul, Vic., 3820.

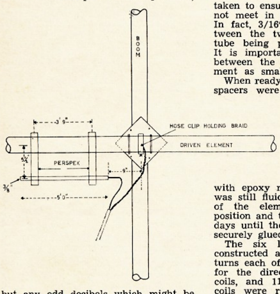
A 20 METRE MIDI-BEAM

GERRY LACEY, ZL2BFU*

The antenna is a much neglected part of Amateur Radio gear and too many people spend far too much money on purchasing something they could quite easily build themselves.

This antenna was born of necessity which, as we all know, is the mother of invention; or perhaps more correctly in this case, the utilisation of other peoples' ideas and modification of same to suit local conditions.

Living in a particularly wind-swept location where a full size quad or yagi on 20 metres would have to take a tremendous beating, it was necessary to produce an antenna with a reduced wind resistance. Also, having the "misfortune" to be surrounded by other active Amateurs, the nearest being less than 300 yards away, it was necessary to produce an antenna with reduced signal pick-up on the back and sides. Gain was not of paramount importance,



but any odd decibels which might be offering would be gratefully accepted. Not being an engineer, it was also important that construction should be reasonably simple and because of this it seemed that "plumber's delight" construction was the obvious method to use. The antenna described here was the result of efforts to satisfy the above requirements.

Aluminium tubing in ZL comes in 16-foot lengths so one length of 2" diameter tubing was used for the boom. This enabled spacing of approximately 0.1 of a wavelength between director and driven element and approximately 0.15 of a wavelength between the driven element and the reflector. There did not seem to be any logical reason why all the elements should not be of the same physical length, the electrical length being adjusted by varying the loading coils. This method seemed to be the easiest, so was adopted.

Each element consists of a 16-foot length of aluminium tubing, 1¼" diameter, for the centre section, at each end of which fit the loading coils. Into the outside end of each loading coil former or spacer, is inserted a 2 ft. 8 in. length of ¾" diameter tubing and into each length of this tubing is inserted a 2 ft. 8 in. length of ⅝" diameter tubing. The outside end of each length of ¾" diameter tubing is cut with a saw slot so that when the ⅝" diameter tubing is inserted, this latter can be clamped firmly into position using a hose clamp.

The wooden spacers at each end of the 16-foot centre section were made of oregon pine 6" long and turned to 2" diameter. One end of each spacer was bored to 1¼" diameter and the other end to ¾" diameter. Care was taken to ensure that the two holes did not meet in the centre of the spacer. In fact, 3/16" of timber was left between the two holes to prevent one tube being pushed inside the other. It is important to keep the capacity between the two sections of the element as small as possible.

When ready for assembly, the wooden spacers were painted inside and out with epoxy resin and while the resin was still fluid the appropriate sections of the elements were pushed into position and then left for three or four days until the resin had hardened and securely glued the sections together.

The six loading coils were next constructed and it was found that 10 turns each of 6 gauge aluminium wire for the director and driven element coils, and 11 turns for the reflector coils were required. The coils were initially wound on a 2⅜" diameter mandrel and when released fitted comfortably over the former, leaving ample clearance all round. No provision was made for weather-proofing the loading coils, but after assembly they were sprayed with a water repellent recommended for use on car ignition systems. In spite of the absence of weather-proofing no falling off of performance has been observed during heavy rain and no change in s.w.r. has been observed.

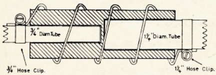
The elements were tuned by taking a piece of wire about four feet long and attaching one end to the element about 18" out from the boom and the other end to a similar position on the element on the other side of the boom. A one-turn link was then made in the centre of the wire and the g.d.o. introduced at this point. It is important to keep the coupling as low as possible to avoid false readings, but this was not difficult.

Tuning was done with the assembled beam resting on a couple of stepladders approximately six feet off the ground and it was found that when the beam was raised to 30 feet, the resonant frequencies rose by about 100 kHz. Most operating from this QTH is done around 14.330 kHz. and the elements were tuned at 6-ft. as follows: Director 14.7 MHz.; driven element 14.23 MHz.; reflector 13.5 MHz. The resonant frequency of the elements is of course adjusted by compressing or expanding the loading coils, but adjustments to the coils on each side of the elements should be kept as balanced as possible.

The s.w.r. worked out at better than 1.5:1.0 over the whole of 20 metres when properly matched.

The driven element was fed using a gamma match, the tube of which is ⅝" o.d. by 5-ft. long and made contact with the element 4 ft. 6 in. out from the centre.

Matching was achieved by removing the braid from about 4 ft. of the co-axial feedline and sliding the uncovered section in and out of the tube until the impedance bridge showed a 75 ohm match. This method of matching was suggested by Max VK2ARZ and it worked out very well indeed. Much



simpler than playing around with a variable capacitor and having to house it in a weatherproof box.

It is, needless to say, important to make sure that the odd strand of the centre conductor of the co-axial cable is not protruding beyond the insulation. For sealing, Silastic 732 RTV was used. This is a silicone rubber produced in the States and is excellent.

The element to boom clamps were made of 7" square pieces of ⅛" thick aluminium, but if the beam was to be re-built, a heavier gauge would be used as the present ones tend to "give" a little in the wind. Ordinary galvanised "U" clamps of appropriate size was used for attaching the boom and elements to the plates.

The all-up weight of the beam is about 25 lbs. and is rotated by a Stolle rotator. An additional thrust bearing has not been used, but this might be useful in taking most of the weight off the rotator. So far the beam has survived gusts of wind up to around 50 knots, but when the weather conditions are tough it can be lowered very quickly with the home-brew tilt-over mast which a thirteen-year-old can raise and lower single handed.

Experiments conducted across the Tasman with VK2ARZ gave the following results: 7 dB. forward gain

(Continued on Page 17)

* 27 Bledisloe St., Masterton, New Zealand.

Commercial Kinks

Listening around 40 metres the other day I was intrigued to hear two Amateurs, both on sideband, complaining about interference on the channel. As everything appeared clear at my end, I was somewhat mystified at their trouble, particularly as it seemed that they were each experiencing a different type of interference. Then I realised that, of course, their common trouble was i.f. break-through! While this is not a common trouble these days, it still plagues many Amateurs using some of the older sideband transceivers.

I well remember the first transceiver I owned, a National NCX-3. A very neat little rig for which I developed quite a liking. Unfortunately though, a local teletype station decided to open up on 5.2 MHz. which co-incided with the i.f. frequency of the NCX-3. The result; teletype at S9 over the entire three bands that the old NCX-3 covered.

No doubt quite a few of the early transceivers were affected in the same way. A few that come to mind are the Eico 753, which also had its i.f. on 5.2 MHz.; the early Swan models also had their i.f. in the 5 MHz. range.. The latest KW Atlanta has an i.f. on 5.2 MHz., and has had trouble from this same teletype station.

Well, what can be done about it? The trouble with most of the early transceivers was that they did not have adequate i.f. rejection. Quite a few did not even have an i.f. trap of any sort built into them. The National Co. soon noted the trouble and sent out details of an external trap that could be connected in the 52 ohm co-ax. feeder close to the transceiver. It consisted of a parallel tuned circuit with a very high capacity of 0.001 μF. The coil can be air wound and has 14 turns of 16 or 18 gauge copper wire. You will probably need to play around a bit to make it resonate on the exact frequency and an air spaced trimmer of around a 100 pF. in parallel with the 0.001 μF. fixed capacity will help to put it spot on. Two further points. Make sure the condenser you use is a good quality mica, and when completed seal the whole thing up in a suitable metal box with co-ax. connectors feeding in and out.

Another worthwhile addition to any transceiver, whether you are troubled with i.f. break-through or not, is of course a good antenna tuner. I have always been convinced that we would have cleaner signals both in and out if we all used one. However, that's another story that might be worth looking into one day.

Now let's get inside our transceivers and see what further can be done to improve the i.f. rejection. Most of the current models use a series resonant trap connected either from the r.f. stage grid or first mixer grid to earth. If you want to fit one to yours, you should make sure that it has high inductance and low capacity. A 3/30 pF. trimmer is ideal.

A slightly different set up, used to my knowledge only in some of the later National transceivers, is that the 5.2 MHz. i.f. rejection trap is installed in series with the cathode lead of the r.f. amplifier tube where the impedance allows the use of a high-Q parallel-resonant trap with an effectively high impedance providing better attenuation than the series tuned circuit mentioned above. The actual circuit consists of a 4.7 microhenry inductance with a 150 pF. mica and a 100 pF. trimmer in parallel, connected in series between the cathode of the r.f. tube and the normal cathode resistor and by-pass capacitor. If you are in doubt as to how it works, send me an s.a.e. and I will send you the complete circuit.

While on the subject of circuits, my offer to help readers has really kept me busy. So far I have been about 90% successful in finding the required data. One that has me tricked is a request from Mr. P. O'Shannessy, C/o. Radio Australia, Shepparton, Vic., for a circuit of a "Weston Radio Telephone" Type LM3 Mk. III. I wonder if anyone can help. If so, please write to Mr. O'Shannessy direct. I have also had a request for modification data on the popular Heath HW single-band transceivers. I have quite a lot of information which will be published in the near future. If you happen to have one of these units and know a few kinks, please let me know.

AN F.M. REPEATER

PART TWO

IAN CHAMPION, VK5ZIP*

CALL SIGN GENERATOR

The identification is generated by an electronic keyer designed and constructed by Rick VK5ZFQ.

The keyer is essentially a binary divider chain of flip flops with a decoding matrix of diodes. This choice was governed almost entirely by generous donations of these parts. The divided chain is driven from an a-stable multivibrator running at the "dit" speed. There are six dividers giving 64 bits in which to generate the call sign. (Slightly less than the number required to generate the recently allocated "VK5WI/R1" so that an extension will have to be made. We can only key "VK5WI R" at present.) The decoding matrix has been designed for easy re-coding.

The usual method of minimising the matrix would need extenive modification for even the simplest change of call sign. The method in this case is to decode only the "spaces" and the "dahs" which inherently gives some minimisation. The decoded spaces inhibit "dits" from an otherwise continuous stream of "dits" via a gate. Spaces between the Morse characters are thus formed. Another gate inserts "dits" to form "dahs" under the control of the "dahs" decoder. The result is technically perfect Morse code.

The square wave output is fed to a three-stage R/C filter network which produces a reasonably sinusoidal signal. This is coupled to the receiver audio prior to the take off point for the transmitter audio. This provides for convenient coupling of the ident to the transmitter and at the same time allows persons on site to monitor the ident through the receiver loudspeaker. The level is set so that the ident deviates the transmitter ±5 kHz. A more detailed description of a similar keyer has appeared since building this keyer in June 1970 "QST".

TEST FACILITIES

Whilst the main concern was to tie the transmitter and receiver together as a repeater, it was essential that some sort of manual control be provided for ease of servicing. Consequently the following control features were extended to the front panel. A two-pole switch marked Simplex/Repeat when switched to the simplex mode disconnects the receiver audio from the transmitter and connects a microphone. The second half of the switch grounds pin 11 of the transmitter control card and prevents the receiver cperating the transmitter.

A second switch, Manual tx, grounds pin 9 of the transmitter control card and turns the transmitter on. This can be operated in either simplex or repeat mode. A third switch, Timer Test, abbreviates the 10-minute timer to 30 seconds to allow a quick functional check of the circuit. The receiver mute and volume controls also appear on the front panel and are pre-set. These govern the system sensitivity and the audio level to the transmitter respectively. A multiposition switch allows metering of the following points:

- Unregulated volts 20-25v. (battery check with mains off).
- Regulated +14v. (power supply check).
- Transmitter volts (comparison of tx volts and reg. volts shows condition of solid state switches).
- Receiver +11.5v. (receiver reg. check).
- Transmitter p.a. current.
- Transmitter driver current.
- Transmitter exciter current.

A voltage sample from the s.w.r. protect circuit displays a relative "reverse r.f." reading that is useful when aligning the transmitter filter. The receiver limiter and discriminator voltages complete the metering facilities. A combined switch/potentiometer allows the receiver audio output stages to be turned on for on-site monitoring and a small socket permits an extension speaker to be plugged in for remote monitoring. (See Aerials and Filters.)

Fuses, a.c. and d.c. isolation switches complete the front panel set-up.

AERIALS AND FILTERS

As it was intended that the transmitter and receiver were to be enclosed within a single unit, it was obviously contrary to this idea to have the aerials widely separated and incur substantial feedline losses. To have both aerials mounted on the same tower was more in keeping with the concept as planned, but to do this and overcome receiver desensitising would require considerable filtering.

Two possible problems were foreseen, namely (1) the direct radiation from the transmitter overloading the receiver front end; (2) noise generated by the transmitter at the receive frequency would greatly affect the signal/noise ratio. This meant that each feedline could require filtering, a rejection of noise at the receive frequency within the transmitter feedline, and a rejection of the transmitter carrier in the receiver feedline.

In anticipation of this problem, a four-section filter was initially constructed as described in March 1970 "QST", and initial on-air tests were done using this filter and two folded dipoles vertically spaced 10 feet. It soon became apparent, however, that a second filter was required, as while the existing filter completely eliminated either one of the two types of interference, the other still remained. Rough calculation suggested that although a second filter was required, it need not be as elaborate as the first, and on this basis a two-section co-axial filter was constructed. With this filter in circuit, and by careful adjustment of the phasing of the aerials, the objective of zero desensitising was achieved.

The repeater went into service in this configuration, but afer a few weeks it became apparent that day to day temperature variations caused sufficient detuning of the filters to affect the system's weak signal performance. After endless hours of experimenting, it was finally conceded that the two-section filter was inadequate and a second four-section filter was constructed. The installation of this filter provided more than adequate safety margin for any temperature drift that would occur.

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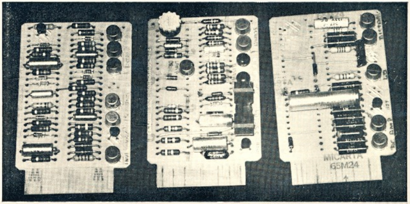


The control circuitry was built on reject computer cards.
Left to right: Ident control card, transmitter control card, 10-minute timer.

* 16 Tarranna Avenue, Parkholme, S.A., 5043.

As previously mentioned, the phasing of the aerials is all important and the technique developed to optimise this may be of interest. It involves the use of a third aerial into which a signal generator (tuned to the repeater receiver frequency) is fed. With the repeater transmitter on, the signal generator is adjusted to produce a noisy signal and the relative position of the two aerials is then adjusted for best signal/noise ratio. The intrepid soul adjusting the aerials is equipped with an extension speaker from the receiver which enables him quickly to optimise the adjustments.

The signal generator and third aerial technique is also used for adjustment of the filters. The need to be able to adjust the strength of the incoming signal over a wide range as the adjustments progressed ruled out the use of other Amateur signals and made the signal generator an indispensable tool.

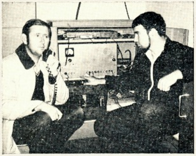
Another aid found necessary to complete the adjustment of the filters was an r.f. indicator of some description. An s.w.r. bridge was permanently connected in the transmit feedline after the filter.

At the time of writing, the two original folded dipoles are still in service. With a general improvement in the weather, further experiments in this area are planned, possibly starting with some 5/8 dipoles.

SUMMARY

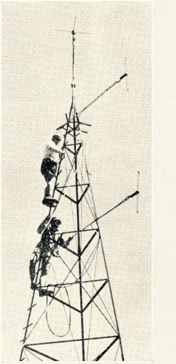
The Adelaide Channel 4 repeater is situated 2,000 feet above sea level on private property at Crafers, about a mile south of Mt. Lofty and overlooking the S.E. freeway. From this location it has 360 degrees coverage from horizon to horizon except for a 15 degree shadow to the north through Mt. Lofty, but due to the topography of the Adelaide hills, it has line of sight to only 50% of Adelaide. Unfortunate as this is, mobile operation is still possible from almost anywhere in the metropolitan area, the most difficult areas being the N.E. and foothills suburbs.

The mobile coverage beyond the metropolitan area has proved to be fairly extensive. To the south it is limited by undulating terrain in places, but ultimately by the Southern Ocean. To the north it is undefined in terms of mobile operation, depending upon terrain and band conditions; mobiles pop in and out well beyond the 60-mile mark. Coverage to the west embraces almost any point on the Yorke Peninsular, while to the S.E. mobiles have worked in excess of 100 miles out along the Duke's Highway.



Garry VK5ZK and Ian VK5ZIP operating the Adelaide repeater VK5WI/R1.

Portable and country stations make light work of these distances, recently Ian VK5ZJF was operating portable from Mt. Lincoln (170 miles), but it surprises nobody any more that Hughie VK5BC at Berri (120 miles) and Tony VK5ZAI at Bordertown (150 miles) popped up for a chat. Jim VK5ZMJ at Port Pirie (140 miles) is another of the seventy sttaions currently using the facility.



Aerial phasing.—The ground plane is part of a commercial system located at the same site.

A few brief contacts made at a time prior to the equipment being optimised auger well for the DX season. Stations in Mildura (200), Mt. Gambier (250) and Warrnambool (350) were worked with excellent signals. During the two metre opening on 30/10/71 VK3AKU, mobile in Melbourne, copied the Adelaide repeater through the transmission breaks of the Geelong Channel 4 system.

In order to maintain its communication potential in times of emergency, the repeater has been equipped with a bank of nickel-iron batteries operating on a float charge system. In the event of a mains failure, the batteries will operate the repeater for two/three days depending upon usage. A low level tone (±1 kHz. dev.) will be audible on all transmissions to alert the repeater group of the condition. Another feature, yet to be included, is an "off-frequency" warning system.

To overcome the problem of netting a transmitter to the repeater input frequency an IC comparator is to be added to the receiver discriminator circuit. Any signal off frequency by more than 3-4 kHz. will initiate a tone on the re-transmission—2 kHz. if high in frequency, 500 Hz. if low. The tone will continue into the transmitter "run-on" period so that any station can check and centre his transmission without the aid of another station. At the time of writing, this piece of equipment was complete and awaiting a convenient moment to be installed.

While it is realised there are many factors governing the approaches to the problem of setting up an Amateur repeater, it is hoped that the ideas expressed here will assist and stimulate ideas for those groups planning to set up an Amateur repeater in this country. If any person or group would like further details or circuits, you may contact the writer at his home address.

In conclusion, the author would like to thank Garry VK5ZK for his assistance in recalling the history of our project and our respective wives for their patience whilst "radio widows". Our thanks go to the rest of the repeater group, to those other stations who donated time and materials, and finally to the Adelaide operators in general whose ready acceptance of the service provided has made our effort worthwhile.

☆

"20 YEARS AGO"

Let's look back 20 years to the May 1952 issue of "Amateur Radio". In fact as from this issue we intend to do this every month. Let's hope it brings a few memories to those of us old enough to have been active Amateurs at the time, and some idea of that era to the young new Amateurs of today.

The big news of May 1952 was the impending opening of the 21 MHz. band. The editorial tells how the 21 MHz. band was first discussed at the Atlantic City I.T.U. conference of 1947 up to the Extraordinary Administrative Radio Conference held in Geneva in 1951, and finally how Federal Executive pressed the Amateurs' case with the Australian Administration. It's a story that is still going on today.

Technical articles in the May 1952 issue include a description of a Low Power 2 Metre Crystal Controlled Transmitter by K. B. Mitchelhill, VK2ANU. With an 832A in the final, it looks like a lot of 2 metre transmitters one sees around even now.

Part eight of "Television Made Easy" by Ken Wall and John Jarman, VK3ADA was devoted to "Interference, and how the Hams can check it". This series of articles created an enormous interest as information on t.v. was rather hard to get at that time.

1951/1952 Ross A. Hull Memorial Contest results give the top scorers as VK5BC with 2521 pts., VK6BO 2285 pts., VK2ABC 2010 pts. Some 45 logs were received and about 200 stations took part. Incidentally, Hughie VK5BC is still as active as ever on all bands from 160 to 2 metres.

DX notes by Frank Hine, VK4QL, indicate that conditions on all bands were at a rather low ebb, the best of the bands being 80 and 40.

What was the average Amateur buying and selling in May 1952? A glance at the Hamads shows in the "for sale" department a Type 3 Mark 2 complete with modulator. An HRO Senior receiver for £60. A Palec valve and circuit tester for £15, plus the usual bits and pieces.

Advertisers still with us include Ham Radio Suppliers on the inside front cover, William Willis & Co. with a large ad. for British "Woden" Modulation Transformers, and R. H. Cunningham with a full page on Eddystone v.h.f. components.

PROGRAMMABLE DIGITAL KEYER

D. A. McARTHUR, VK8KK*

For years I have used meteor and forward scatter techniques on v.h.f. This is an interesting facet of our hobby. Procedures for using c.w. are defined by the medium and, although s.s.b. is an advantage, c.w. still remains a highly reliable form of transmission. "Pounding the Brass" during scatter contacts was very tiresome and an alternative means of generating c.w. sought; the use of digital techniques seemed to be the answer.

It was decided early in the design that not only call signs should be generated, but a flexible, random-selectable, programmable facility would be required. The unit I propose to describe has the following features:—

(1) Fully solid state.
(2) Use of ICs for simplicity.
(3) Capable of having a full QSO without touching the key.
(4) Capable of changing the programme at will.
(5) Repeat and re-cycle operations.
(6) Reset to start and reset at any stage.

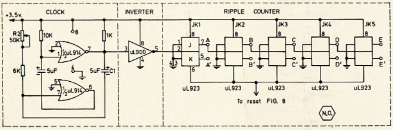
Thus, with the basic specifications, a few typical examples of what the keyer will perform would be:—

CQ CQ CQ DE VK8KK repeated three times, END K.

WA6XXX (3X) DE VK8KK (3X) RST 599 END K.

CQ CQ CQ DE VK8KK BK listen for period "X" and repeat.

In other words the keyer is versatile to cover all forms of basic QSOs.



CLOCK AND PRIMARY COUNTER FIG. 1

BASIC BLOCK DESCRIPTION

The theory of producing digital c.w. is not new and many articles have been published in recent years on the subject. However, to begin at the beginning it is best to have a variable speed clock. As will be seen later, this is the speed control for the c.w. being sent. The clock is a basic multivibrator using dual nand gates (see Fig. 1). The frequency of the multivibrator can be controlled to give a resultant c.w. speed of approximately 5 to 35 w.p.m.

The output of this clock drives a five-stage ripple counter (or divider) of which the true and false outputs feed into a diode decoding matrix. The output of this matrix will give cyclic counts 0-31 (32 counts).

Bit 0 of this counter is used to drive a secondary 16-bit counter. This secondary counter is used to select the encoding sequence stored or programmed. A switching matrix, between the secondary counter and the programmes, selects the order and any repetitions which may be required. The last four counts (bits 12, 13, 14 and 15) are not fed to the switching matrix but are arranged to zero keyer output. This is used to provide blank time for listening periods, hence saving an extra 32 switches.

The storing of programmes is achieved by an arrangement of diodes across the basic 32-bit counter. These programme lines are activated by the secondary counter pulses of which the sequence of programme selection is set by the condition of the switching matrix. The output of all 32 basic count lines are "OR'D" to form the primary keyer output. This primary output is fed to an inverting shaping network, thence to another inverting stage to drive the actual keying transistor, which keys the normal 50 volt negative bias line of the transmitter. A split is taken at the input of the keying transistor—which is in grounded base—to control a dual nand gate audio oscillator. This then drives an audio amplifier IC type TAA300 providing inbuilt audio sidetone.

CLOCK

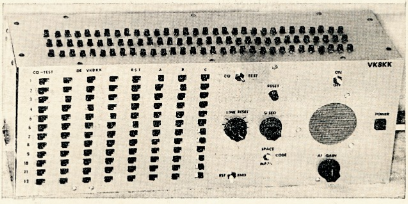
This consists of a Fairchild uL914 (dual Nand/Nor), connected as shown in Fig. 1. It provides pulses with repetition rates variable by potentiometer R1. Note that this potentiometer was wired back to front to allow for linear control of the speed (type C taper). The timing circuit p.r.f. is dependant on R2/C1.

The output waveform is shown in Fig. 3. This is fed to a uL900 inverter to provide correct pulse directions and adequate drive to the primary counter. (Note uL923 requires —ve going pulse edges for triggering.)

PRIMARY RIPPLE COUNTER AND DIODE COUNT DECODER

This consists of five Fairchild JK flip-flops type uL923. Pins 1 and 3 are grounded and the clocked input is applied on pin 2. True and false outputs appear at pins 7 and 5 respectively. The true output of each preceding JK drives the clocked input of the succeeding stage. Thus the true outputs (A-E) and the false outputs (A'-E') can be represented as in Fig. 3. To obtain the decimal output (i.e. 0-31 counts) the binary outputs of the primary counter must be decoded in the diode B/D matrix. Here computer germanium diodes were used for cheapness.

To explain the decoder matrix function, count 2 will be used as an example.



Front view of Digital Keyer.

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Count 2 decimal = 00010 in binary.

As E is the most significant bit of the counter the outputs for count 2 can be expressed thus—

00010 = EDCBA = required output from the **true** sides of JK.
11101 = E'D'C'B'A' = required output from the **false** sides of JK.

Thus to gate out count 2 the diodes are arranged as such—

True side of JKs:
A = zero (no diode).
B = one (diode).
C = zero (no diode).
D = zero (no diode).
E = zero (no diode).

False side of JKs:
A' = one (diode).
B' = zero (no diode).
C' = one (diode).
D' = one (diode).
E' = one (diode).

Hence whenever there is a condition of 00010 (count 2) a logic 1 appears at the output of that decoding line. This means that for 32 counts 5 x 32 diodes or 160 diodes are required initially. Having completed the binary to decimal decoder, the output lines will step from 0-31 at a speed determined by the speed setting of the clock.

The logic levels will be—

+1.2 to +1.5 for a logic 1, and
+0.2 to +0.5 for a logic 0
for each count output.

This may be checked with a c.r.o. or multimeter. Before progressing any further, it is highly desirable to prove this section is working correctly. There may be a double count or no count at all for some numbers due to faulty or incorrectly wired diodes. It is reasonably easy to fault-find by applying logic thus—

If a count output is achieved at count 15 and count 7 on line 7 but not on line 15, then by converting both to binary—

7 = 00111 = E'D'CBA
15 = 01111 = E'DCBA.

The only difference is diode D, and this is thus suspect.

STORED PROGRAMME MATRIX

See Fig. 4. At this point the builder must decide what he wishes in permanent store. In my case the following were chosen for my own application:—

Line 1—CQ.
Line 2—TEST.
Line 3—DE VK8KK.
Line 6—RST.
Line 7—END K.

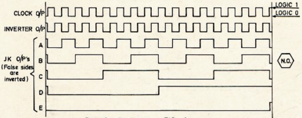
Note that DE VK8KK occupies three lines (3, 4 and 5).

Here it is suggested that the builder uses graph paper to discover how much area is required and what can be fitted into one line (yearn for the call sign of E5EE!).

As described earlier, there are 32 counts or 0-31; delete count 0 as this will be used for timing purposes. There remain 31 programmable bits.

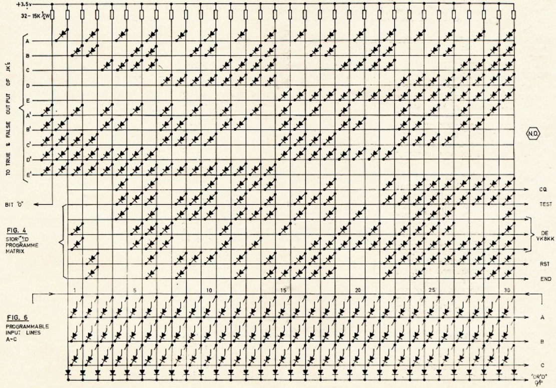
Imagine if counts 1-31 were "OR" gated, then the output from this "OR" gate would always be a logic 1. Now the problem of generating the c.w. This is very simple. Morse Code parameters are:—

Dot = 1 unit of time.
Dash = 3 units of time.
Space between characters = 1 unit of time.
Space between letters = 3 units of time.
Space between words = 5-7 units of time.



TIMING DIAGRAM FIG. 3

FIG 2 PRIMARY COUNTER & DIODE DECODER MATRIX Including fixed & variable programmes



Hence by taking the Morse symbol for A = ·—, the timing will be as follows:—

Dot (1 unit of time),
Space (1 unit of time),
Dash (3 units of time).

Furthermore, relating this to the 32-bit counter, it can be seen, by placing diodes where spaces are needed, the Morse symbol can be thus—

"A" will occupy 5 units of time or 5 counts.

Count 1 = Logic 1 = a Dot
Count 2 = Logic 0 = Space
Count 3 = Logic 1 }
Count 4 = Logic 1 } = Dash
Count 5 = Logic 1 }

A call sign will usually occupy three lines, unless you have a very short one —short, that is, in terms of dots as these take up least units of time. The format used is shown in Fig. 3. Examination of the placement of the diodes reveals the stored programme.

condition it should be a logic 1 (or open circuit for that matter). This is obtained by using a uL900 feeding each programme line, as the drive factor is high. Hence a logic 1 from the secondary counter via the inverter (logic 0 output with 1 input) performs the read operation.

MANUAL SWITCHING MATRIX

This is a simple method of selecting the order of the c.w. being sent. In Fig. 7 it is shown in the condition of CQ CQ CQ DE VK8KK.

The horizontal designations indicate the programme sources whilst the vertical designations indicate the secondary counter sequence. Diodes are used to isolate the secondary counter from the programme lines.

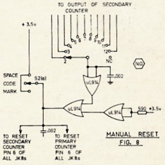
VARIABLE PROGRAMME INPUT LINES

These consist of three lines of 31 bits (switches) designated A, B and C. They are used to set up any additional information such as signal report or another call sign. Each switch is programmed in the same sense as the stored programme lines. Each switch must be capable of providing a logic 0 or a logic 1. This is achieved vide Fig. 6 by the use of diodes in the same configuration as is used in the programme lines though all count sequences must be capable of producing logic 1s and thus diodes are required in all 31 counts.

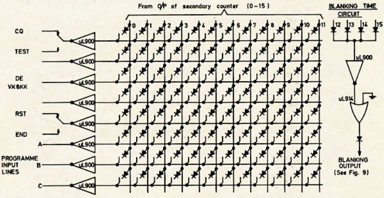
The 31 primary bit counts are in parallel with the three lines of 31 programmable inputs. These lines are selected in the same way as the fixed programme lines, that is by placing a logic 1 (from secondary sequence counter) at the input to a uL900 inverter, the output of which will fall to a logic 0 and thus read out that particular line.

RESET CONTROL

It is necessary to be able to reset the sequence counter at any time. Although there are 16 count sequences it is not entirely necessary to be able to reset at every count. As 11-position switches are common, only 11 positions or counts for reset were provided. Counts 0, 12, 13, 14, 15 were deleted—the last four, as explained earlier in the basic block description, to provide "blank time". The 11th position of the switch provides a non-reset condition. This allows the secondary counter to count to its full capacity (0-15 or 16 counts), which, when completed, will start again back at count 0. Thus by the rotation of the switch the secondary counter can be reset at the desired position pertaining to what is being sent.



MANUAL RESET FIG. 8



PROGRAMME LINE DRIVERS FIG. 5

MANUAL SWITCHING MATRIX FIG. 7

The outputs of the secondary counter (logic 1) are fed to switch S1, the output of which feeds uL914 and is further inverted in the other half of this IC providing the desired logic 1 on the reset rail feeding all JKs.

Capacitors C5 and C6 are used to provide r.f. filtering and delay. The uL914 is used as it has a low input loading effect on the secondary counter.

SECONDARY COUNTER AND DIODE COUNT DECODER

This is exactly the same as the primary counter except that the count is only to 15, i.e. 0-15 or 16 counts. The clock pulse comes from bit 0 of the primary counter via inverter 6 to JKs J6-9. Here only four JKs are required for the 16 counts and all circuitry is the same as for the primary counter.

The secondary counter is used to control and sequence the manual switching matrix. This is achieved in the following manner. In Fig. 4 "CQ" is stored on line 1 of the stored programme matrix and if it is desired to send "CQ" three times in succession then counts 0, 1, 2 (from the secondary counter) are required to activate line 1 of the stored programme matrix (CQ). Further, if it is required to send VK8KK following the three CQs, then counts 3, 4, 5 (of the secondary counter) will activate lines 2, 3, 4 of the stored programme matrix (DE VK8KK).

ACTIVATION OF STORED PROGRAMME MATRIX

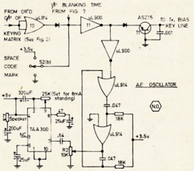
See Fig. 5. To read any programme line, the line concerned has to be a logic 0 (grounded) and in the idle

MANUAL RESET FACILITY

Manual reset (Fig. 8) is provided to achieve correct starting sequence of the digital keyer. This is achieved by placing a logic 1 on both primary and secondary counter reset lines (pin 6 of IC uL923) via the function switch S2 (space/code/mark). This resets both counters to count zero before sending c.w. Thus the digital keyer will always commence at the start of the programme.

KEYING AND MONITOR CIRCUITS

See Fig. 9. The OR'd output lines (31 primary counter lines all OR'd together) feed IC 10. This is a uL914 which is used as a low loading inverter.



KEYING AND MONITORING CIRCUITS FIG. 9

The output from the OR'd key lines is a logic 1, in the key-down condition, and will cause a logic 0 at the output of IC 10. This is turn will cause a logic 1 at the output of IC 11 (uL900) providing a high output loading to drive—

(a) Transistor T1, in grounded base which will key the bias tx line;

(b) The a.f. monitoring circuit.

The reasons for using double inversion through ICs 10 and 11 provide for lighter loading on the keying matrix output and also cleans up the ragged waveform caused by varying logic levels—mainly this is due to the differing forward resistance of the primary counter decoding diodes. See **diode decoder** logic levels.

This effect could cause false switching states as the ICs normally will change state at 0.7v. positive.

A.F. MONITOR AND AMPLIFIER

All logic 1 conditions from the keying line (a key-down condition) will cause the multivibrator uL914 to turn on. This generates a 4 kHz. tone and is applied via a.f. gain control potentiometer R2 to the input of a 1-watt a.f. amplifier IC type TAA300 (see Fig. 9). An internal 3″ 8-ohm speaker provides the final link in the chain.

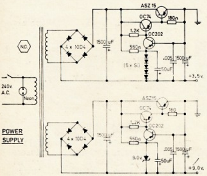
The use of the a.f. multivibrator key circuit is a highly useful tool in fault finding as it gives a tone on all logic 1 inputs applied to it, and thus can be used instead of a c.r.o. or multimeter where visual means of readout are needed. The switchable link in the circuit has been provided for this purpose.

POWER SUPPLY

Two basic supply rails are required for the +3.5v. logic circuits and +9.0v. for the TAA300. The transformer on hand at the time was a twin 12v. A & R rated at 2 amps.—more than adequate for the purpose.

The current drawn from the +3.5v. line varies up to 300 mA. under some keying formats, whilst the TAA300 draws about 12 mA. on peaks.

The regulation achieved during testing provided a 0.05v. variation for load of 0-1 amp. The regulated +3.5v. is achieved by the use of selenium diodes. They have a forward voltage drop (in the conducting condition) of 0.7v. and



POWER SUPPLY

thus five were selected to give +3.6v. Forward current was set to 20 mA. via R5 to achieve adequate stability. A suitable zener diode could have been used but the voltage spread at these low voltages is normally undesirable. The +9.0v. line is regulated by the conventional zener diode.

CONSTRUCTION

It is suggested the constructor use plug-in end connectors on the boards. The boards are double sided and were hand carved, not etched, mainly as design continued whilst building. As the logic levels are of quite a low order, care in avoiding a voltage drop must be remembered. Multi-stranded wire was used between the boards. This is vital on the 31 bit lines and the 16 bit lines.

The diodes were obtained from old computer boards. The switches (the cheapest available) came from a commercial supplier.

In conclusion, the keyer has been in use for over a year without a single fault. It can be seen that any amount of variations can be made to suit particular needs without much change to the basic concept.

ACKNOWLEDGMENTS

I wish to thank Colin Wall (VK8CM) who did the photography, and David Tanner (VK-3AUU, ex-VK8AU) for his suggestions in producing this Digital Keyer.

SUITABLE REFERENCES

Fairchild RTuL Composite Data Sheet, SL218.
Nashelsky, "Digital Logic," etc.

A 20 METRE MIDI-BEAM

(Continued from Page 9)

over the dipole; 25 to 30 dB. front-to-back and side attenuation up to 50 dB. One Amateur less than one mile away from this QTH indicated that with my signal adjusted to show S9 at his QTH, he virtually lost the signal entirely when the beam was rotated side on to him.

For various reasons the beam is mounted only 30 feet above the ground at the moment and no doubt better reports still could be obtained by raising the height of the beam and getting the advantage from the lower angle of radiation which would result.

The overall results with this beam have been most pleasing, enabling me to carry on QSOs without difficulty when it would have been quite impossible using a vertical, dipole or a G5RV.

— . . . —

AFTER-THOUGHTS

Readers are requested to amend their copy of the Part Two Slow-Scan T.V. article in "A.R." March 1972, page 7, as follows:

1st column, 3rd line of last para. should read: . . . A.W.A. **line oscillator** coil type 40047 . . .

2nd column, 4th para. should read: . . . exception of the **"P"** channel FET type 2N5462. A Fairchild type **2N4360** was used, but almost any **"P"** type should suffice.

3rd column, Semiconductors, No. 1 should read: Q11, Q17.—Fairchild **2N4360** or any **"P"** type FET. Note.—Do not fall for the trap and use **"N"** types that may be on hand.

The circuit in Commercial Kinks, "A.R.," April 1972, page 18, showing the audio derived a.g.c. system—please note that diode D2 has been shown reversed in polarity.

TECHNICAL ARTICLES

Readers are requested to submit articles for publication in "A.R.," in particular constructional articles, photographs of stations and gear, together with articles suitable for beginners, are required.

Manuscripts should preferably be typewritten but if handwritten please double space the writing. If possible collaborate with any local draughtsman, student or engineer to do illustrations after the method shown in "A.R.," May 1971, page 5. Otherwise drawings will be done by "A.R." staff.

Please address all articles to:
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VICTORIA, 3002

1972 John Moyle Memorial National Field Day Results

As a newcomer to dealing with the National Field Day Contests I was impressed with the interest in the 24-hour multiple operator section. There were quite large set-ups, involving up to 10 operators and up to six transmitters, working all bands from 160 metres to 70 cm.

If my experience with similar groups on similar projects is borne out, a great time was enjoyed by all.

Another matter of interest was the high participation by the VK3 Division. I suspect they are in training for the R.D. Contest?

My participation count of portable/mobile stations was as follows: VK1 3, VK2 16, VK3 55, VK4 5, VK5 12, VK6 2, VK7 3. I guess that an odd log or two got lost in the post?

In spite of the 96 listed above, we were down eight logs on last year, and participation could have been much better.

It is much more interesting, if after going to some trouble preparing for a field day, operators can be kept active. If the DX bands are open, it is very good, but more local fixed station activity would help.

VK4 was recovering from a cyclone which reduced activity there and the Victorian power strike would have taken toll of fixed stations. C.w. activity was very minor.

Thanks for the interesting comments. Bill VK7BM went to site by boat, and carried gear up sand-banks, up three down two, assisted by mossies and flies. Don VK3AHG and John VK4IE remarked on the friendly spirit. Jon VK6TU found 20 and 15 metres the only usable bands.

Some listeners had problems with their scoring, with which I will deal direct.

Standard of logs was high, particularly in the high scoring logs, and there were quite a few "copybook" logs.

I hope that you can organise a picnic day/week-end for next year's Contest and you will have a good time.

—Peter VK4PJ, Chairman, Federal Contest Committee.

SIX-HOUR DIVISION

Section A—Tx Phone:

VK2RJ	739 points
3ZA	853 "
3BBC	719 "
3AHG	546 "
3EF	415 "
3YQ	249 "
3AJP	85 "
VK4IE	763 "
VK5WI	380 "
VK6TU	209 "
VK7BM	255 "

Section B—Tx C.W.:

VK2YB	73 points

Section C—Tx Open:

VK7AL	574 points

Section D—Tx Mult. Op.:

VK3BDQ	2 ops.	528 points
VK4PJ	2 ops.	564 "

Section E—Tx Fixed:

VK2ZO	200 points
2JM	20 "
VK3BEK	130 "
3WM	80 "

Section F—Receiving:

G Clements, VK3	540 points
C. Thorpe, L4018	225 "
C. Hannaford, L50096	655 "
W. Clayson, L50015	480 "
M. Bosma, L60012	345 "

24-HOUR DIVISION

Section A—Tx Phone:

VK3DY	1360 points
3BBB	1063 "
3ZYP	306 "
3WM	135 "
VK4XZ	787 "
VK5RG	150 "
VK7AX	143 "

Section B—Tx C.W.:
Nil.

Section C—Tx Open:
Nil.

Section D—Tx Mult. Op.:

VK1VP	3 ops.	2038 points
1ACA	5 ops.	1438 "
VK2WG	9 ops.	2732 "
2ATZ	5 ops.	1419 "
VK3ATO	10 ops.	3882 "
3ATL		3338 "
3XK	4 ops.	3053 "
3MT	10 ops.	1868 "
3ATM	8 ops.	1719 "
VK5BW	3 ops.	3386 "
5AWI	9 ops.	2964 "
5LZ	6 ops.	1769 "

Section E—Tx Fixed:

VK3AYL	775 points
3AGF	720 "
3RN	515 "
3AUN	495 "
VK4IC	760 "
4PV	125 "

Section F—Receiving:

J. Vaarnela, VK2	1180 points
W. Newport, VK2	161 "
E. Phillips, VK3	265 "
I. Kirk, L50145	1220 "
B. Chammen, L5118	1014 "
R. Everett, L7043	1045 "
E. Trebilcock, L30042,	c.w. check log.

☆

TRADE NEWS

Our good friends, R. H. Cunningham Pty. Ltd. announce a change of address for their Head Office to Cr. Dryburgh and Victoria Streets, North Melbourne.

NEW CALL SIGNS

DECEMBER 1971

VK3JG—J. V. Griffin, 85 Percy St., Glen Waverley, 3150.
VK3XI—H. G. Dugan, Laang Rd., Garvoc, 3275.
VK3ADT—V. A. Garnier, 16/27 Avoca St., South Yarra, 3141.
VK3ATI—R. Garnier, 16/27 Avoca St., South Yarra, 3141.
VK3ATV—A. J. Wighton, 6 Marcella Crt., Glen Waverley, 3150.
VK3AXY—J. O. Sanders, 2/78 Mathoura Rd., Toorak, 3142.
VK3AXZ—S. J. Donald, 64 Xavier St., Oak Park, 3046.
VK3BBN—J. Rotenberg, 6 Jeffrey St., Lower Templestowe, 3107.
VK3BGH—J. G. Hancock, 35 Glenebor Ave., Blackburn, 3130.
VK3YGO—P. W. Anderson, 42 James St., Belmont, 3216.
VK3YGP—R. G. Thomas, 2/12 Rosedale Ave., Glenhuntly, 3163.
VK3YUE—J. J. Sadauskas, 28 Gardenia Rd., North Balwyn, 3104.
VK3ZAZ—S. R. Gregory, Site of 3LK, Lubeck, 3378.
VK3ZDT—D. F. Taylor, 2 Walter St., Bulleen, 3105.
VK3ZGL—T. J. Barter, 7 Boonbarry Ave., Blackburn, 3130.
VK3ZJU—J. S. Sen, 31 Strezleki Rd., Yallourn, 3838.
VK3ZKH—D. K. Haustorfer, Apsley, 3319.
VK3ZKK—B. J. Wilson, 19 William St., Mt. Waverley, 3149.
VK3ZLG—L. G. Dowsey, 29 Woonah St., Chadstone, 3148.
VK3ZLQ—R. F. Hall, 64 Churchill Ave., Ararat, 3377.
VK3ZOA—J. A. Shaw, 34 Madeline St., Burwood, 3125.
VK3ZOS—P. R. James, 18 Brownbill St., East Geelong, 3219.
VK3ZSK—K. Sutcliffe, 66 Savige St., Morwell, 3840.
VK3ZTF—E. W. Boord, 2 Melrose St., Mordialloc, 3195.
VK3ZUE—J. U. Esselstrom, 7 Bowen St., Warragul, 3820.
VK3ZYG—J. C. Dennis, 69 Taylors Rd., St. Albans, 3021.
VK4BT—L. J. David, 82 Frangipani St., Inala, 4077.
VK4DU—N. W. Deague, 21 Illawong St., Buderim, 4556.
VK4ET—G. D. Widnall, 31 Kingstown Ave., Boondall, 4034.
VK4HF—R. A. Fulton, 3 Savoy Dr., Florida Gardens, Surfers Paradise, 4217.
VK4HX—W. D. Jackson, 24 Savoy Dr., Florida Gardens, Surfers Paradise, 4217.
VK4CEC—C. A. Cantor, 145A Grafton St., Warwick, 4370.
VK4ZET—E. L. Thomas, 47 Albert St., Rockhampton, 4700.
VK4ZHN—C. J. Hearn, 14 Trafford St., West Chermside, 4032.
VK5ZOS—O. G. Schmidt, 1 Verco Crt., Campbelltown, 5074.
VK6FF—F. McCartney, 22 Rudall Ave., Newman, 6753.
VK6OM—R. C. Marschke, R.A.A.F. Base, Pearce, 6085.
VK6CIQ—G. W. Hitch, Station: Portable; Postal: 49 Pandora Dr., City Beach, 6015.
VK6ZKA—M. W. Alsop, Station: House 827, Warrara St., Tom Price, 6751; Postal: P.O. Box 271, Tom Price, 6751.
VK7IR—I. R. Milne, 156 Roslyn Ave., Blackmans Bay, 7152.
VK7RH—R. L. Harwood, 5 Helen St., Launceston, 7250.
VK8VJ—C. M. Smith, 3656 Byrne Circuit, Moil, 5792.
VK8ZRD—D. R. Gordon, 3437 Yeadon Circuit, Moil, 5792.
VK9AI—G. N. Marks, P.O. Box 227, Madang, N.G.
VK9CC—D. Coyle (Rev.), Catholic Mission, Mt. Hagen, N.G.
VK9ZGM—G. Mears, C/o. D.C.A., P.O. Box 2087, Konedobu, P.

JANUARY 1972

VK1WB—W. A. Wells, 3 Booroondroa St., Reid, 2601.
VK2OP—E. A. Parker, 3 Cassidy Pde., Wagga, 2650.
VK2BMR—R. Miller, 3/18 Glena St., Fairfield, Qld., 4103.
VK2BNN—G. E. Gibson, 1201 Anzac Pde., Malabar, 2036.
VK2BNR—Nirrimba Radio Club, W.E.E. School, H.M.A.S. Nirrimga, Quakers Hill, 2764.
VK2BPI—P. R. Tomson, 91 Curban St., Balgowlah, 2093.
VK2ZNL—G. A. Puckett, 9 Alexandria St., Hunters Hill, 2110.
VK2ZTI—J. E. Conway, 1 Woodpark Rd., Sheridan Heights, 2161.
VK2ZTS—K. W. Close, 4 Goundry St., Gateshead, 2290.
VK2ZTY—N. D. Repin, 24 Bennelong Cres., Bellevue Hill, 2023.
VK2ZUA—J. J. Sharland, 897 Horsley Dr., Smithfield, 2164.
VK2ZXG—J. A. Gardner, 4 Tobruk Ave., Allambie Heights, 2100.
VK2ZXH—A. P. Minzenberger, 23 York St., Singleton, 2330.
VK2ZXM—R. K. Peters, 1/6 Putland St., St. Mary's, 2760.
VK2ZXP—D. J. Palmer, 32 Willoughby St., Epping, 2121.
VK2ZXT—J. E. Crighton, 78 Liverpool St., Paddington, 2021.
VK3CN—R. N. Elms, 18 Heritage Dr., Springvale, 3171.
VK3HD—J. P. Jonasson, 2 Roberts Ave., Castlemaine, 3450.
VK3KW—L. O. White, 48 Hart St., Niddrie, 3042.
VK3PE—J. Euripides, 208A Bridge Rd., Richmond, 3121.
VK3UV—L. E. Martin, 28 Leura St., Murrumbeena, 3163.
VK3ASE—B. R. Bathois, 3 Connewarra Ave., Aspendale, 3195.
VK3AYK—I. A. Keenan, 94 Dendy St., Brighton, 3186.
VK3BAI—J. F. Westley, 8 The Lookout, Heathmont, 3135.
VK3BDQ—D. S. McQuie, 34 Glengariff Dr., Mulgrave, 3170.
VK3BFJ—K. McL. Roberts, 42 Redesdale Rd., Darebin, 3079.
VK3BFU—F. W. Bendon, 40 Price St., Essendon, 3040.
VK3BFV—A. V. Savory, 13 Orion Pl., East Doncaster, 3109.
VK3BFY—A. C. McBurnie, 35 Irvine St., Mt. Waverley, 3149.
VK3YGR—D. K. King, 113 Johnstone St., Broadmeadows, 3047.
VK3YGS—G. J. Clare, 4/18 Alma St., Lower Plenty, 3093.
VK3YGT—G. R. Uebergang, 1304A Mair St., Ballarat, 3350.
VK3YGU—R. L. Loveridge, 25 Milloo Cres., Mt. Waverley, 3149.
VK3YGV—R. W. Moore, 22 Strelden Ave., North Clayton, 3168.
VK3ZBP—T. F. Pool, 42 Festival Cres., Keysborough, 3175.
VK3ZGV—J. F. Sutcliffe, 24 Snowgum Rd., East Doncaster, 3109.
VK4KN—R. J. Sieber, 50 Formosa Rd., Gumdale, 4154.
VK4NM—A. B. Nyhuis, 82 Cinderella St., Machan's Beach, 4870.
VK5UY—D. L. Marshall, 52 Godfrey Tce., Leabrook, 5068.
VK5VY—P. B. Mayer, 11 Orley Ave., Stirling, 5152.
VK5ZST—R. W. Stephenson, 27 Hobart Rd., Henley South, 5022.
VK5ZSW—R. H. Whellum, 46 Tyne Ave., Kilburn, 5084.
VK6LW—W. M. Peterson, 25 Kingsland Ave., City Beach, 6015.
VK6CIJ—R. W. H. B. Jones, 61 People's Ave., Gooseberry Hill, 6076.
VK6ZBY—Bunbury Cathedral Grammar School, Gelorup, via Bunbury, 6230.
VK6ZDE—D. Edwards, 52 Parklands Square, Riverton, 6155.
VK6ZDR—R. H. A. Cochrane, Station: Flat 62, Hillside Gardens, 57 Malcolm St., Perth, 6000; Postal: G.P.O. Box J1586, Perth, 6001.
VK8ZGF—J. M. Farmer, 4/19 Gason St., Alice Springs, 5750.
VK8ZKL—K. T. Lock, 9 Milner Rd., Alice Springs, 5750.
VK9AP—K. C. Parker, P.O. Box 586, Madang, N.G.

LICENSED AMATEURS IN VK

DECEMBER 1971

	Full	Lim.	Total
VK0	14	2	16
VK1	90	30	120
VK2	1389	519	1908
VK3	1318	677	1995
VK4	527	213	740
VK5	515	219	734
VK6	365	138	503
VK7	157	65	222
VK8	37	11	48
VK9	89	13	102
	4501	1887	6388 Grand Total

JANUARY 1972

	Full	Lim.	Total
VK0	14	2	16
VK1	91	30	121
VK2	1389	527	1916
VK3	1323	676	1999
VK4	528	212	740
VK5	514	219	733
VK6	363	138	501
VK7	155	65	220
VK8	36	12	48
VK9	90	13	103
	4503	1894	6397 Grand Total

QSP

(Continued from Page 2)

The Council also determined that a review of the effects of the Grade D licence on the Amateur Service be carried out after a period of five years from its inception.

The adoption of this policy represents the culmination of an intensive examination of the Australian Amateur licensing structure initiated by the question of Novice Licensing. It is not proposed to deprive any existing licensee of any privileges already possessed. The policy takes into account all arguments advanced for and against a Novice type licence, it proposes new Australian licences that would be in accord with International Radio Regulations (which require a Morse code qualification below 144 MHz.) and simultaneously sets forth a structure that offers reasonable incentives for advancement to gain greater privileges.

Another most important Council decision was the direction to proceed with the setting up of an advisory body to deal with v.h.f./u.h.f. matters, in particular, band planning. The Victorian Division undertook to provide such a body which will work in co-operation with other specialist groups within the W.I.A.—groups such as the Federal Repeater Secretariat and the W.I.A. Project Australis. Council envisaged that, looking at the overall view, the v.h.f./u.h.f. advisory group would recommend blocks of frequencies be set aside for particular purposes—say repeaters—and then other specialist groups determine the precise "modus operandi" of their particular interest within that frequency block.

Other recommendations from Council were that for the time being at least, the f.m. simplex channels within the two metre band remain unchanged. Also that the Federal Repeater Secretariat undertake a technical investigation into the possibility of shifting the existing repeater output frequencies up by one megahertz and providing existing repeaters with two output signals for a changeover period of, say, 12 months or two years. Such a proposal would allow new users to set up in the new system whilst existing users have the change-over period to make the change if they so wish. In this way, the spectrum immediately below 146 MHz. could be cleared for use by the newly formed Amateur Space Service. It should be clearly understood that this is a proposal in the early stages of investigation and that a decision to actually recommend a frequency shift for repeater outputs has yet to be taken.

Detailed results of all the other discussions will be covered in the official minutes, production of which has commenced immediately after the conclusion of the Convention. However, members with queries should consult their Federal Councillor, who will either have the answer or be able to get it.

Only those that have ever participated or sat in a Federal Convention will appreciate the amount of work done by the group of fifteen or twenty Amateurs—work that was done during their Easter "holiday". Easter 1972 was no exception.

—D. H. RANKIN, VK3QV,
Federal Vice-President.

VISITORS TO THE CONVENTION

An Observer, Michael J. Knott, VK7ZMK, attended a Convention for the first time this year and commented: "Not having been to a Federal Convention before I was not fully aware of the vast machinery moving at a steady pace fulfilling a purpose, namely the overall operation of keeping Amateur Radio 'on the air'.

"It has become most apparent that without an organisation encompassing the whole of Australia (and Territories) looking after our interests, our transmitting privileges would disappear so fast we would not have time to turn off the rig."

He went on to say that the W.I.A. is essential and must be big enough to stand up for our privileges, internationally and otherwise and commented that some members pass adverse comments on the Institute as "too big", "lost the original aims of Amateur Radio", "no longer a hobby". He thinks the critics hit back at "the system" and he traces briefly the transition from experimenters to users of frequencies as the reason we must now justify our allocations. Hence "We must have strong representation to fight for our submissions or act on our behalf."

Even our own administrators pay subscriptions and therefore any decisions affect all members including the decision makers. "A an observer it is most apparent that we are being ably looked after by the members of the Federal Council."

NEW ZEALAND COMMENT

The Editor of "Break-In", the journal of N.Z.A.R.T., Don Mackay, ZL3RW, attended much of the Convention along with co-tourist Gareth Bradshaw, ZL3VP, an N.Z.A.R.T. Councillor. Don wrote of the differences between their system of conducting national business and that of the W.I.A. and of his apparent slowness in appreciating those differences and the reasons for them.

(continued next page)

He went on to say: "While observing at this Conference it is interesting to note similar type motions from States as those we have in New Zealand. Some of the topics which are discussed are items to be encountered and sorted out in the future in New Zealand, while other subjects (e.g. v.h.f. band plan) has already been promulgated in New Zealand."

He met Bill Roper, the Editor of "A.R." and he considered most worthwhile an interchange of problems and ideas between them. He touched upon the past interchange of visitors between W.I.A. and N.Z.A.R.T. and said: "One thing for sure comes out of all this—closer liaison and better understanding between Amateurs and their organisations is in turn better for all Amateurs in fulfilling their hobby.

"I am truly impressed," he writes, "in the way Federal Councillors argue their point of view. Members of the W.I.A. can be proud of their representatives at the meeting this week-end to make a better and greater world of Amateur Radio."

A parting shot from the scribe. If you had the time and could have dropped into the Convention this past Easter why didn't you? As a member of a Division you have the right to attend as a listener to every open session of the Federal Convention. An invitation is not needed. This Australian W.I.A. belongs as much to the W.I.A. Victorian Division as it does to every other W.I.A. Division. If this were not so, it would not have been listed in the Events Calendar.

MORE STANDARDS

The Standards Association of Australia announce the issue of a new Aust. Std. 1188 SAA Code for Safety of Electronic Equipment. This is based on international practice and is stated to cover additional precautions when using voltages in excess of 1 kv. and special measures when using high r.f. The SAA also announce the availability of their Annual List with Index and "AS Marks".

SKYLARC-SKYLAB

The proposal by Amsat to provide a Radio Amateur communications package for leisure time use by the crew on Skylab has been most regretfully rejected by N.A.S.A. at this stage of the programme. Many factors contributed to this decision, not least being priorities, funds and the diversion of management attention at a critical time. See February "A.R." page 10 for background details.

THIRD-PARTY TRAFFIC

Canada is stated to have third-party agreements with CE, CP, HI, HR, OA, TI, W and K, XE, YS, YV, 4X, 4Z. The U.S.A. third-party agreements extend additionally to several other South American countries and to W/8P and K/8P, XP, EL, 4U1ITU and official Amateur Satellite traffic with VK (special).

I.A.R.U. CERTIFICATES

WAC-SSTV. Yes, the I.A.R.U. now have a certificate for worked all continents on SSTV. Endorsements are currently available or RTTY, 160 and 80 mx, and 50 MHz.

S-METERS

A rig with a new S-meter and the mini skirt have a lot in common. Both save a lot of guesswork. (A.R.N.S.)

MAGAZINES

Delays in the receipt of U.S.A. magazines on subscription and other publications appear to be ended. This was caused by dock strikes in the U.S.A. Incidentally, the R.S.G.B. has announced price increases in their publications caused by massive increases in printing costs.

TECHNICAL ARTICLES

Got some pet project on the bench which works? The project, not the bench! Since, of course, a bench is always at work even if it holds a long cold soldering iron from falling onto the floor. How about telling us about it?

A.R.M.S.

Mr. Bob Snell, G3SBT, now living in Melbourne is the VK representative for A.R.M.S., the British Amateur Radio Mobile Society, devoted entirely to mobile working. A magazine is issued each month to members and is claimed to be the only Amateur Radio mobile periodical in the world. The subscription to this is £1 per annum or you can send $2.35 to his address at "The Pines," Locarno Ave., Kallista, Victoria, 3791.

PROJECT AUSTRALIS

Compiled by Richard Tonkin, W.I.A. Australis Launch Co-ordinator

The Amsat Oscar C (AO-C) satellite is still scheduled for launch in July. These notes about the satellite were compiled from articles appearing in the quarterly issues of the Amsat Newsletter. Amateurs and non-Amateurs wishing to join Amsat should contact their State Oscar Co-ordinator for application forms. A list of State Co-ordinators appears at the end of this article.

The following facts should be noted about the AO-C (Oscar 6 after launch) satellite and operations connected with it.

(1) The maximum Doppler shift on the 2 metre repeater input frequency is plus or minus 3 kHz. This means that a total guard band between s.s.b. stations of the order of 10 kHz. will be required.

(2) The sensitivity of commercial h.f. s.s.b. receivers should be checked before they are used to receive the 10 metre repeater output from the satellite. In the past, experience has shown that performance of such units on 10 metres is less than optimum for receiving satellite signals.

(3) People using helical antennas for AO-C should note that right circular polarisation should be used for both the 2 metre repeater uplink and for the 435 MHz. telemetry beacon downlink (if carried).

(4) George Long, VK3YDB, is building a 435 MHz. transmitter which, if time and satellite power permits, will transmit the 24-channel Morse telemetry and codestore data from the satellite (this data will also be transmitted on 29.450 MHz.). Note that this 70 cm. transmitter is a telemetry beacon and will not be capable of being used as a repeater.

(5) Unlike Oscar 5, there will be no need to send AO-C telemetry reports to either the W.I.A.-Australis or Amsat. This is primarily a repeater satellite and the telemetry is serving a housekeeping function in reporting on the status of the spacecraft.

OSCAR STATE CO-ORDINATORS

N.S.W.—Alan Hennessy, VK2RX, 23A New Illawarra Rd., Bexley North, N.S.W., 2207.

Vic.—W.I.A.-Project Australis, P.O. Box 67, East Melbourne, Vic., 3002.

Qld.—Lawrie Blagbrough, VK4ZGL, 54 Bishop St., St. Lucia, Qld., 4067.

S.A.—Gary Herden, VK5ZK, 52 Arthur St., Plympton Park, S.A., 5038.

W.A.—Don Graham, VK6HK, 42 Purdom St., Wembley Downs, W.A., 6019.

Tas.—Peter Frith, VK7PF, 181 Punchbowl Rd., Launceston, Tas., 7250.

An article describing the AO-C 2/10 mx repeater appeared in March "A.R." on page 24 and a description of equipment recommended for use with AO-C may be found in "A.R." Dec. 1971, page 14. Note that only the description of equipment to be used with the 2/10 mx repeater is applicable, as the German and Australian systems will not be flown on AO-C.

Photo by Howard Rider of an actual licence examination in Djakarta, Indonesia, last year. Of the three invigilators, standing, R. A. J. Lumenta, YB0BY, has his back to the camera, beyond him is K. H. Kwik, YB0CJ.

OBITUARY

G. L. HALL, VK7GH

Tasmania lost one of its oldest Amateurs when Mr. Geoff Hall, VK7GH, passed away on 17th February, 1972.

Geoff obtained his experimental licence in June 1925 when he was officer-in-charge of the large power station at Waddamana in the central highlands of Tasmania. From then on, he was very active on 80 metres and the old 32-33 metre band, using a single tube self excited oscillator in a coupled Hartley circuit with an input of about 30 watts. He also had permission to use non-Amateur frequencies to transmit urgent traffic in the event of the failure of the normal land line connecting the power station with the rest of the power network.

After his retirement, Geoff lived at Rosetta and Lindisfarne and despite suffering from a heart condition he maintained his keen interest in Amateur Radio and was active on the 3.5, 7 and 14 MHz. bands, using a modern sideband rig and an indoor roof antenna.

He was most co-operative and unassuming and had a keen Amateur spirit. Geoff will be sadly missed by his associates who will always remember him as a perfect gentleman.

Dr. I. R. PEARSON, VK7KB

We regret to report the death of Dr. Ian Richman Pearson, VK7KB. Born in Berwick, Vic., Ian spent part of his early life at Jarvis Bay and in the United States pursuing pharmacy, medicine and radio. Later he was associated with the Launceston General Hospital and practised in the south of Tasmania.

Moving to Burnie in 1948 to take up a local practice, he renewed his station licence from previous years and it was from this time that he became so well known. He was a leader in v.h.f. communications in the area and was active on all bands.

In 1949 he won a W.I.A. Award for 100 DX Countries and later a Medal for top score in the Jubilee VK-ZL Contest. He was an excellent c.w. operator. At various periods his interest was focused on hi-fi, radio comm. and car racing, maintaining his own vehicle, and added to his medical practice; he was always very busy. However, he was a perfectionist in all he did.

A few years ago Ian suffered a serious illness which incapacitated him to such a degree that for a time he was unable to follow any activity whatsoever. Overcoming adversity, he came back to radio after retiring to Port Sorell and was appointed the Tasmanian Intruder Watch Co-ordinator. He will be sadly missed by numberless acquaintances all over the world.

We extend to his XYL Jean and family our sincere sympathy.

1971 "A.R." AWARDS

The Publications Committee have granted the **Higginbotham Award** jointly to Les Jenkins, VK3ZBJ, and Harold Hepburn, VK3AFQ, for their articles on the "Transistorised Carphone" in the issues of March, April and June.

Awards for Technical Articles were made to C. Renton, VK4CR, for his "Filter Type SSB Transmitter" article in the December issue and to John Adcock, VK3ACA, for his articles on 160 metre antennas in the May to September issues.

— . . . —

Worked Zone 14 Countries.—There are 27 countries, Class A is for all 27, Class B 22, and Class C for 15 countries in Zone 14. GCR list plus a dollar or 10 IRCs to award manager s.w.l. activity, Box 209, S-780-24, Idkerberget, Sweden. Two IRCs extra for higher classes if wanted, and s.w.l.'s are eligible.

DX NOTES

It is much regretted that the usual DX Notes for this month have not arrived on time. Knowing that so many members look forward to this column, it had been possible in the past to prepare back-up notes at the last minute to cope with mail delays and the like. With Easter and the Federal Convention at the beginning of April it proved quite impossible to contact people to prepare any stand-by notes on this occasion.

From the Dec. '71 copy of "The Indian Radio Amateur" comes news from A.R.S.I. that the 40 and 80 metre bands had been withdrawn from use in India by the Amateur Service, until further notice.

Reports to hand indicate that there are more and longer periods of poor conditions on the DX bands, but these have been interspersed with periods of really excellent propagation. Most DX-ers hope these latter good openings do not presage a mighty let-down.

Here are the predictions for May from charts by the I.P.S.D. Times are local for first-named area, i.e. "H" to 120 deg. E, "I" for 120 deg. to 135 deg. E., and "K" for 135 deg. to 150 deg. E. Notes: VK4(T) is Townsville, VK0 (C) is Casey, VK0 (M) is Macquarie Is., 1F and 2F are modes, SP and LP are Long Path and Short Path respectively.

28 MHz. Band:

VK1—VK6			1000-1700	
	ZS6		1600	
	5Z4	minus 2	1600	plus 1
VK3—9V1			1000-1700	
VK4(T)—KH6		minus 2	1200	plus 4
VK5—KH6		minus 2	1000	plus 1
		minus 2	1400	plus 1
VK6—ZS6		minus 2	1600	plus 2
	5Z4		1200-1800	

21 MHz. Band:

VK1—EA		minus 2	1700	plus 2
	G (SP)	minus 1	1800	plus 1
	G (LP)	minus 1	0800	plus 1
	PY1	minus 1	0900	
	VE1 (SP)	minus 2	1100	plus 1
	VE1 (LP)		0900	plus 1
	W6	minus 6	1200	plus 4
	ZS6	minus 1	1600	plus 3
	5Z4	minus 2	1600	plus 3
	8P (SP)	minus 2	0900	plus 6
	8P (LP)		0800	plus 2
	9G1 (SP)	minus 1	1700	plus 2
			0900	
	9G1 (LP)		0600	plus 1
			1700	
VK3—UA		minus 5	1800	plus 1
	VE7	minus 3	1400	plus 1
	VK8 (1F)		0800-1900	
	VK0 (M)	minus 5	1500	plus 1
VK5—KH6			0700-1700	
VK6—G (SP)			1400-1900	
	W6	minus 5	1100	plus 3
	ZS6	minus 4	1600	plus 3

14 MHz. Band:

VK1—G (SP)		minus 1	0700	plus 4
			2200-0500	
	G (LP)	minus 2	0800	plus 12
	PY1	minus 2	0900	plus 8
			2000	
	VE1 (SP)		1200-1600	
			2100-0200	
	VE1 (LP)	minus 1	0900	plus 5
	VK6		0900-1900	
	VK8 (2F)		0800-1200	
			1400-1800	
	VK0 (C)		1000-1900	
	W6		1300-0400	
	ZS6	minus 2	1600	plus 6
	8P (SP)	minus 3	0900	plus 13
	8P (LP)	minus 2	0800	plus 4
	9G1 (SP)		0800-1200	
	9G1 (LP)		1300-1900	
VK3—UA			0700-1200	
			2100-0500	
	VK8 (2F)		0800-1200	
			1400-1900	
	VK0 (M)		0800-1900	
VK5—KH6			1200-0600	
VK6—W1			1900-2400	

7 MHz. Band:

VK1—G (SP)		0400-0700
	G (LP)	1600
	VE1 (SP)	1600-2100
	VK6	1800-0800
	W6	1600-0100
	8P (SP)	1500-2100
	9G1 (SP)	0300-0900
VK5—KH6		1600-0200

It is interesting to compare these with the predictions in April "A.R." and to reflect upon the gradualness of the seasonable changes.

A late item of "hot" news from Alf Matthews, VK3ZT, is that the Mellish Reef DX-pedition is definitely on despite the lack of assistance. The scheduled date is expected to be the latter part of June. Please see "A.R." for Feb., page 12.

VHF

Contributing Editor: ERIC JAMIESON, VK5LP, Forreston, South Australia, 5233.
Closing date for copy 30th of month.
Times: E.A.S.T.

AMATEUR BAND BEACONS

VK0	53.100	VK0MA, Mawson.
	53.200	VK0GR, Casey.
VK3	144.700	VK3VE, Vermont.
	144.925	VK3ZQC, Moe South.
VK4	52.400	VK4WI/2, Townsville.
	144.390	VK4WI/R1, Toowoomba .
VK5	53.000	VK5VF, Mt. Lofty.
	144.800	VK5VF, Mt. Lofty.
VK6	52.006	VK6VF, Bickley.
	52.900	VK6TS, Carnarvon.
	52.950	VK6VE, Mt. Barker.
	144.500	VK6VE, Mt. Barker.
	145.010	VK6VF, Bickley.
VK7	144.900	VK7VF, Devonport.
VK8	52.200	VK8VF, Darwin.
ZL1	145.100	ZL1VHF, Auckland.
ZL2	145.200	ZL2VHF, Wellington.
ZL3	145.300	ZL3VHF, Christchurch.
ZL4	145.400	ZL4VHF, Dunedin.
JA	52.500	JA1IGY, Japan.
HL	50.100	HL9WI, South Korea.

A new beacon has been added to the list this month, that of one in Darwin, Northern Territory. News finally trickled through to me that such a beacon was operating and that it had already been heard in Nauru by Bob C21AA ex-VK2ASZ). It runs 50w. input to stacked dipoles antenna.

A change of call sign for the VK4 two metre beacon from VK4VV (now allocated to Mrs. Linda Luther, of Brisbane) to VK4WI/R1. Advice has been received from Roy VK6ZFL that the Carnarvon beacon is still well and truly operational and has been included in the list again. Roy also mentions that HL9WI in South Korea is temporarily QRT whilst changing to a new job, but hopes to be back on 6 metres again soon. The HL9WI beacon has been included as it could well be operating again by the time this is read.

Mike VK2AM (previously VK2II) has further news of the proposed VK1 beacon which indicates it will probably go on top of a nine-storey building in Civic Centre, with a reasonable take-off to Sydney. Frequency 144.475 MHz., ID with call sign in code by f.s.k. 850 Hz. shift, 10 watts to a turnstile antenna. It is hoped to have the beacon operating this year. This will be a welcome addition to the beacon population. What we need now is a 2 metre beacon in Alice Springs and the long proposed 6 and 2 metre beacons in Sydney and the Commonwealth beacon coverage will be about complete.

Still on beacons, there is a strong possibility the Mt. Barker beacon VK6VE on 144.500 may be shifted to Albany some time this year. Continuous testing carried out between Garry VK5ZK and Bob VK6BE and Wally VK6WG indicate there are many occasions when a QSO has been possible on 2 metres when VK6VE has been inaudible in Adelaide due to being situated some 20 miles inland from the Albany operators, with the result it has not been serving its purpose adequately. Since 3rd January 1972 there have been about 16 openings on 2 metres between VK5 and VK6 at Albany, and there have been occasions when VK5VF has been stronger than VK5ZK, but by the same token contacts have been made between VK5ZK and Albany when neither beacon has been audible. The whole operation is a very interesting one and is to be the subject of a special article for "A.R." by Bob VK6BE in the near future.

SIX-METRE DX

The 6 metre band has really opened up for stations in favourable situations for t.e.p. during March. John VK4ZJB in Brisbane has telephoned me on three occasions reporting on the high level of activity available in VK4, extending to VK6 and VK2. John reports an opening to JA, KX6 and KR6 on 18/3/72 during the afternoon when the band became completely chaotic with a screaming mass of signals, and for about an hour it was well nigh impossible to work anyone. S9 reports both ways for hours, stations being worked mobile, others with dipole antennas, stations with a few watts of power, etc. T.v. stations from Asia were occupying large areas of band space. Following John's advice, I personally monitored 6 metres the following day, and heard a JA2 and a JA7 for four minutes at 1415. Nothing else! About the only opening of any consequence here in VK5 was on 22nd March when Tony VK5ZDY had eight contacts between 1530 and 1630 hours with JA0, 1, 7, 8 and 9. No one else appeared to be at home in VK5.

In VK2 the t.e.p. season got off to a good start on 6th March (following several brief openings previously) when the band really opened up. Roger VK2ZRH was home on that day and advised all JA districts were available, Vladivostok t.v., etc., from 1140 to 1600. The signals peaked to S9 both ways, and Roger worked one JA running 10 watts to a dipole! On Thursday, 9/3, a few contacts at 2000 hours were made to JA from Sydney and Tom VK2NN heard the HL9WI beacon. Further JAs were worked on 11/3 between 1400 and 1500.

As if all this is not enough to make us envious in VK5, a further telephone message from John VK4ZJB gives news of an outstanding contact. Des (a right hand helper for John) and John VK4ZJB were on a mountain and worked Bob C21AA in Nauru on 6 metres on 1/4/72 at 1400 hours with signals peaking to S9 both ways. Opening lasted for seven minutes. Bob was also worked by Malcolm VK4ZEL in Brisbane. Des and John consider this brief opening was probably assisted by influence from cyclone "Emily" off the coast of Queensland. Whatever the reason, this contact will make the southerners' mouths water!

CARNARVON NEWS

Apropos my comments in this column a couple of months ago when I queried whether the Carnarvon beacon, VK6TS, was still in operation, such a query brought a ready response in the form of a nice letter from Roy VK6ZFL from that town, confirming the beacon was still going, and that the regular reception reports they receive from JA and HL areas have encouraged them to keep the beacon operating. It has now been in almost continuous operation for three years and is located at the Tracking Station. It uses a QQE03/12 in the final, running c.w., with a mechanical keyer, power output about 8 watts to a dipole mounted vertically about 40 ft. high.

Roy goes on to say that a message from JA1LZK advises of plans to send a DX-pedition to JD1 this year with 6 metre equipment, and he suggests this will be worth listening for during our Spring months.

VK6ZFL is about the only active 6 metre station in Carnarvon, and is thus confined mostly to t.e.p. and occasional Es openings. He reports that for some reason Eastern States contacts have so far eluded him during his five years in Carnarvon. He operates a Heathkit HW-32 and a home-brew transverter. There is a stirring of interest in 144 MHz. in the area, especially since a station at Exmouth, about 170 miles further north, plans installing a 146 MHz. transceiver. T.v. from Perth (600 miles) and Geraldton (300 miles) can regularly be viewed, and points to the possibility of inversion type contacts on 2 metres on the same path. VK6VF on 2 metres has been heard on several occasions. (Thanks for your letter Roy, and good luck with your projects—will always be interested to hear your results. —VK5LP.)

Mike VK2AM advises a possible upsurge in 2 metre activity in Sydney, with 55 converter kits sold and a further 50 to be sold. This, coupled with a likely VK1 beacon this year, may see big things from Sydney yet. On 2200 MHz., Dick VK2BDN and Bill VK2ZAC will soon be trying a DX type contact as Dick has constructed his gear for portable operation. Good luck chaps.

From the VK3 scene comes news that my old friend Bob VK3AOT has relinguished the position of Publicity Officer for the V.h.f. Group. I am sure all readers will say "Thank you Bob, for a job well done." In his place we welcome Geoff VK3YER and look forward to hearing from him each month. Geoff certainly is right up to the mark with his equipment, and operates on 6 and 2 metres a.m. and f.m., and transmits on 432 MHz. His problems sound a bit like mine, having to operate from the bottom of a 150 ft. valley! However, he goes out on all field days and so finds some compensations there.

Geoff VK3AMK is still well up on the list of activity with working to VK3ANP in Wangaratta and VK3ZKN in Tahara, both on 6 metres. He advises more country stations could work into Melbourne on Sunday morning on six if they came on before 1000 hours when Channel 0 starts transmission. So there's a thought for you country operators.

BARBADOS ISLAND

From Jim VK5NB comes news that a former South Australian Allan (exVK5ZEI) is now resident in Barbados and has the call sign 8P6EN. He normally operates between 14150 and 14190 kHz. at 2100 nightly, and is currently engaged in setting up a 6 metre station. This has probably been hastened somewhat by the report from Allan that another Amateur on the island has now worked 34 countries on 6 metres! What a score—this must surely be at the top of the ladder. Without detracting from this gentleman's achievement, we must still give credit to our own Doug VK8KK for his 14 countries at my last counting. The Barbados area is situated geographically close to many different countries whereas Australia is in virtual 6 metre isolation. However, no matter where one lives, 6 metres has been and will always be a band of considerable attraction, and full of surprises.

T.E.P. WARNING SYSTEM

On behalf of the Amateurs of Australia I would like to thank the Ionospheric Prediction Service for their efforts in providing broadcast reports on the h.f. bands (where they might be heard by all), of the progress of t.e.p. conditions and hope that there have been many who have made good use of the information so provided. The stations were a little hard to find at times amongst all the QRM, but being on s.s.b. certainly helped. It is to be hoped the service can be continued again in September, and in subsequent years to come. Plenty of reports returned to the Service of contacts made or hearing of t.e.p. stations will no doubt assist in having this service continued.

Additional news is scarce this month, so the notes will close at this point. Thought for the month: "A driver is safer when the road is dry; the road is safer when the driver is dry." Until next time, 73, Eric VK5LP. The Voice in the Hills.

CALIFORNIAN SIX-METRE BEACON

12450 Skyline Blvd.,
Woodside, California, 94062.

Editor "A.R.," Dear Sir,

The WB6KAP six-metre beacon station near San Francisco, California, has recently been re-activated on an attended basis on 50.013 MHz. (a frequency change), until June 21. The format is the same as used previously, transmitting the first half of each minute and listening the last half on 50.101 MHz. (for the ZK1AA beacon). A receiver and chart recorder are in operation on this frequency 24 hours a day during the listening periods. In addition, tape recordings are made from 1800 to 0900 GMT. These are then spot checked, erased, and re-used within a week. Times of transmitter operation will be at least 0200-0900 GMT, longer on week-ends. The beacon transmitter power is 900 watts and the antenna is an array of four 5 element yagis pointed towards the Cook Islands. The station is located on a hill overlooking the ocean about 30 miles south of San Francisco.

I am requesting reception reports from "Down Under" for not only this season, but also for previous years. I have received reports of reception of my beacon by Australian Radio Amateurs during the months of April and October.

I am continuously monitoring by chart recordings, the video carrier frequencies used in the lowest Australian and New Zealand t.v. channels (46.250 and 45.250 MHz. respectively). Stations have been received on these frequencies or 10 kHz. offsets more than half the days since the middle of March when these recordings were started. Signals appear on the New Zealand frequency as early as 2100 GMT and on the Australian frequency a couple hours later, and have lasted as late as 0300 GMT. No signals have yet been received this year on the audio channels (51.750 and 50.750 MHz.) (they are not being monitored continuously) but strong signals were received on 50.750 MHz. on occasion during the Spring of previous years, indicating very probable openings to the ZL 51 MHz. band. No New Zealand Radio Amateur stations were heard, however.

During periods when I am aware of t.v. signals coming in, I will also attempt to monitor near 51 and 52 MHz. for Australian and New Zealand Radio Amateur stations. I may also be reached after my nightly liaison schedule with ZK1AA on 14.082 MHz. at 0500 GMT, or by telephone 415-851-1570 (unlisted number).

—Victor R. Frank, WB6KAP.

FEDERAL AWARDS

W.I.A. 52 MHz. W.A.S. AWARD

Amendment:

Cert. No.	Call	Add. Countries
101	VK4ZFB	4

W.I.A. V.H.F.C.C.

Cert. No.	Call	Confirmations 52 MHz.	Confirmations 144 MHz.
82	VK3AUN	102	—
83	VK3AKR	—	125

KEY SECTION

This column has been missing for the past couple of months because I have been overseas and so nothing was submitted to the editor. He was probably grateful as I am told there is very great pressure on space at present.

The Section is seeking members, because without members we cannot offer section activities to make membership more attractive (if you follow!). Full rules appeared in "A.R." for Nov. 1971. If you work c.w. at all consistently (and it is consistency, not prowess, which is required) you would qualify—so why not apply? Membership certificates will have been posted to most members during April, and I hope to get the first membership list published in "A.R." soon.

While I was in Copenhagen, OZ7DX, Vogg, drew my attention to the "Fairytale Award" which is a c.w. only award offered by E.D.R. To qualify VK stations must work one each of the call areas OZ1-OZ9, and at least three stations from the Odense district, by two-way c.w. For anyone interested, I have more complete details, and so has the award manager, OX7XG, E. Hansen, 14 Sophus Bauditz Vej, DK-5000, Odense, Denmark.

Till next time, 73, Deane VK3TX.

SILENT KEYS

It is with deep regret that we record the passing of:—

VK7GH—G. L. Hall
VK7KB—Dr. I. R. Pearson
W3ZM—H. D. Helfrich

DIVISIONAL NOTES

VICTORIA

The principle activity this month is the Geelong Hamfest on Saturday, 13th, and Sunday, 14th May. The Hamfest includes events for the whole family. On the Saturday a social evening has been arranged whilst numerous events take place on the Sunday. While the OMs are taking part in the various fox hunts a bus tour has been arranged to show their families around Geelong.

Bookings can be arranged by contacting Terry Leith, VK3ZXY, on Melb. 329-6333 (bus.) or Melb. 37-1267 (home), or Bob Wookey, VK3IC, on Geelong 052-212674.

Also during May, the Divisional general meeting will take place on Wednesday, 3rd May, and the V.h.f. Group will meet on Wednesday, 17th May. All are welcome to attend both these meetings which are held in the Divisional rooms at 478 Victoria Pde., East Melbourne. 73, Gil VK3AUI.

QUEENSLAND

The inaugural meeting of the Sunshine Coast Amateur Radio Club was held on Tuesday, 27th January in Nambour on the Sunshine Coast. Election of office-bearers resulted as follows:—

President, John Purdon, VK4PU; Vice-President, Ken Chiverton, VK4VC; Secretary, Wayne Shaw, VK4WE; Treasurer, Bill Rayn, VK4WR; Public Relations Officer, Norm McRae.

A spokesman for the club said that the meeting was successful with 20 persons attending, 12 of whom were licensed Amateurs.

EVENTS CALENDAR

May 3—VK3: Divisional Meeting; Rooms.
May 13/14—VK3: Geelong Hamfest.
May 17—VK3: V.h.f. Group Meeting; Rooms.

— . . . —

OVERSEAS MAGAZINE ABSTRACTS

This month our review takes a different form, comments being limited to one article in each of two magazines.

"Ham Radio," January 1972, carries an extremely interesting and informative article titled "Phase Locked Loop RTTY Terminal Unit". This is a new design, solid state AFSK demodulator and selector magnet driver with features most wanted by RTTY operators.

"QST," January 1972. "The Macromatcher"—an r.f. impedance bridge for co-axial lines. A simple instrument designed for the measurement of complex impedances in the frequency range 3.5 to 30 MHz. —VK3ASC.

HAMADS

Four lines FREE for members only.
See Jan. 1972 "A.R." page 23 for complete details.

FOR SALE

Gove, N.T.: Inoue 700 solid state rx, tx and 240v. a.c./12v. d.c. p.s.u. speaker unit. Cables and manuals. 1969 model. Spare tx tubes. As new. Air freight free to Darwin. Going Yaesu way. $450. Write VK8KG, QTHR. No phone.

Dapto, N.S.W.: T.C.A. (1674) 25w. 2 FM Transceiver (12v. transistor supply), 2 ch. switching (B. 4), dynamic mike, $75. T.C.A. (1674) 12w. 6 FM (52.525 MHz.) (needs a.c. p.s.u. and mike), $20. VK2AFF, 24 Barellan Ave., Dapto.

Melbourne, Vic.: HA600 solid state all band rx to 30 MHz., FET front-end, variable BFO, AM, CW, SSB, S meter, $95. VK3AQ, QTHR. Phone (03) 288-2326 evenings.

Sydney, N.S.W.: Creed 7B Teleprinter, $25. Philips low-band FM, $10. Carphone 6v. pwr. supply, $5. 12K speaker, $2. Mono turntable, $1. VK2AAB, QTHR. Ph. (02) 48-4051.

Exmouth, W.A.: Exchange near new Drake R4B for Eddystone 940 or 830/7, or sell $675. VK6ZDZ QTHR.

Glen Waverley, Vic.: AM Tx, Geloso 4/102 Exciter, 807 PA, CW, modulator, and PSU, $35. VK3ZU, Phone (03) 560-5136.

Sydney, N.S.W.: Complete set IF and RF coils for AR88D. Brand new in orig. packing, orig. cost $30. Offers? VK2AXJ QTHR. Ph. (02) 798-9021.

Melbourne, Vic.: National NCX-5 Transceiver, incl. AC Power Supply, good cond., $390. 40 yds. Co-ax. RG8U, new, $15. Wetter, 78 Eley Rd., Box Hill South, 3128.

Shepparton, Vic.: Yaesu FL200B Transmitter, good condition, $160. Yaesu FR50 Receiver, 5-band, d/conv. rx, $150, or both units for $300. VK3IC, QTHR. Ph. 058-214647.

Kyabram, Vic.: 4-band linear, 10-15-20-40 metres, pair 572B valves, maximum legal power, $80. VK3TG, OTHR. Ph. 058-521636.

Sydney, N.S.W.: Swan 500C Transceiver, AC and 12v. mobile PSU, matching spkr. box, desk mike, all mint condition, $425. VK2AQW, QTHR. Ph. (02) 449-3538 AH.

Melbourne, Vic.: Acitron DC-DC P/S type 3003, 400w. outputs: all voltages required to operate most h.f. transceivers. Handbook, $40. A.W.A. BS50 hi-band FM base station, $70. VK3AOT QTHR. Ph. (03) 277-8295.

Glen Waverley, Vic.: Eddystone 888A Amateur-band Receiver, 160/10 mx, as new, $160. K109 SWR Meter, band new, $15. VK3OM, QTHR. Ph. (03) 560-9215.

Garran, A.C.T.: Heathkit SB102 Transceiver, as new, little use; with AC or DC PSU and original manuals, $500. Alternate PSU $60. VK1AN, QTHR. Ph. (062) 81-5905.

Melbourne, Vic.: Yaesu Musen FR100B Receiver, FL200B Transmitter, both in A1 condition, $435. H. Cliff, VKHC, QTHR. Ph. (03) 49-1017 bus., (03) 45-2536 AH.

WANTED

Cavendish, Vic.: AR88 Receiver. Instruction Handbook No. 19 Wireless Set. C. Gracie, P.O. Cavendish, Vic., 3408.

Melbourne, Vic.: Control Unit to suit (and backing plate if possible) for ARN6 Radio Compass. Keyboard to suit either Creed or Model 15 Teletype machine, any condition. Write/phone VK3AQB, 76 David Ave., E. Keilor. Ph. (03) 337-4902.

Kilaben Bay, N.S.W.: Data for Cossor Cathode Ray Tube type 89J, will compensate for any effort. VK2ZEK, 204 Kilaben Bay Rd., Kilaben Bay, 2283.

Golspie, N.S.W.: Crystals, 80 and 40 mx, purchase any types, any frequency. VK2BDT. QTH "Glenelg," Golspie, 2580.

Melbourne, Vic.: Communication Rx, Trio, Lafayette or similar. Ph. 467-3121 bus. hrs.

Melbourne, Vic.: Yaesu FRDX400 Receiver in good condition. Ph. (03) 46-4200 or write VK3AUN, QTHR.

Marble Bar, W.A.: Quality Transceiver. Cash. Cox, Headmaster, Marble Bar, W.A.

Canterbury, Vic.: Vinten MTR13. VK3HE, QTHR. Ph. (03) 83-2820.

Adelaide, S.A.: Windmill Tower, triangular, minimum height 40 ft. Please state all relevent details and price to VK5AS, Gary Hambling, 9 Hoover Rd., Henley South, S.A., 5022.

Concord, N.S.W.: Pre 1930 Wireless Sets and other ancient wireless bits such as Horn Speakers, Magnetic Detectors, Bright Emitter Valves, Spark Sets, etc. VK2AAH, QTHR. Ph. (02) 73-2369.

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Penetrant: Penetrates to loosen frozen parts in seconds.

Volume Resistivity per ASTM D-257: Room temperature, ohm/cm.; 1.04×10^{12}.

Dielectric Constant per ASTM-877:
Dielectric Constant 2.11, Dissipation Factor: 0.02.

Dielectric Strength per ASTM D-150:
Breakdown Voltage 0.1 inch gap, 32,000 volts.
Dielectric Strength volts/inch, 320,000 volts.

Flash Point (Dried Film), 900 degrees F.
Fire Point (Dried Film), 900 degrees F.

TESTS AND RESULTS: 950 degrees F.

Lawrence Hydrogen Embrittlement Test for Safety on High Tensile Strength Steels: Passed. Certified safe within limits of Douglas Service Bulletin 13-1 and Boeing D6 17487.

Mil. Spec. C-16173 D-Grade 3, Passed.
Mil. Spec. C-23411, Passed.

Swiss Federal Government Testing Authority for Industry: Passed 7-Day Rust Test for acid and salt water. Passed Weiland Machine Test for Lubricity as being superior to mineral oil plus additives.

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